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SCIENCE 6

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ya he

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FOREWORD

This book is prepared as per the New Syllabus framed on The National Policy on Education-1986. The Core Elements and Human Values that are stressed in the Policy are kept in view in developing lessons.

The Directorate is grateful to all those who have participated in the production of the Book and the publishers who have brought out this book in time. Suggestions for improvement of this book are always welcome.

Y.R. Achyuta Rao
Director of Text Books
Bangalore

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Dt. 5-3-1993

PREFACE

This Book has been reprinted after editing and making necessary corrections. The Directorate is grateful to all those who have assisted in producing and editing the book. The Directorate welcomes suggestions for further improvement of the book.

Director
DSERT & Text Books
Bangalore-560 004

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SIR. C.V. RAMAN

Chapter - 1

SCIENCE IN EVERYDAY LIFE

The developments that have come through Science

We have heard our grand parents saying, "During our time, matters were not as they are today. Now-a-days, things are different and there are so many changes". Out of curiosity, if we question them, they will talk about the changes that are taking place. Most of these changes have come through science.

Today, not only we use cotton clothes, but we use clothes made of nylon and polyester. Instead of using metallic buckets, we use plastic buckets. Along with bullock carts, horse-driven carts and hand pulled carts, we see vehicles like bicycles, cars, buses and scooters on the roads.

Apart from huts and mud buildings, we see cement buildings and multi-storeyed buildings. To get better yields of food grains, fruits and vegetables, we use artificial fertilizers along with compost manure. We protect food crops from pests by spraying pesticides. We constantly improve the quality and variety of seeds.

Parents protect their children by immunising them against many diseases by timely vaccination and inoculation. We also see kerosene, gas and electricity being used, along with firewood for cooking.

With the help of radio and news papers, events which take place anywhere in the world are brought to us, within the shortest span of time. Live-programmes on sports and other events can be viewed through television, right at our homes. We can talk to people who are far away through the telephone.

Gun Powder is used to explode rocks. But the same

gunpowder can endanger the lives of human beings and animals, if used to make bullets and bombs. Deadly atom bombs can be prepared using uranium, which can be otherwise used to obtain electricity from atomic energy.There are some chemicals which are used to manufacture fertilizers and pesticides, in order to grow and protect food crops. The same chemicals can be used for preparing poisonous gases. If these chemicals are used for the purpose of war, it results in the loss of millions of living beings.

All these bring home, the fact that science has limitations. However, attempts are being made to find solutions to all these problems.

In these hundreds of ways, science has helped to solve problem in the fields of food, clothing, shelter, health, transport and communication. Science has also widened our knowledge about the world that we live in. Through this knowledge, we can bring about further improvements in the things that we use.

Activity : 1.1

Make a list of the names of different types of clothes that we use Group them into two classes, namely those made from natural fibres and those made from artificial (synthetic) fibers.

Activity : 1.2

Invite a doctor to your school and get answers to the following questions:

1. *What is triple antigent? From what diseases does it protect?*
2. *Which diseases have been eradicated from India?*
3. *How were they eradicated?*

Activity : 1.3

Visit a shop that sells seeds and fertilizers or invite a farmer to

the school and collect data about the following:

1. *Names of the fertilizers that are used to get better yields of sugarcane, paddy and vegetables.*
2. *Names of medicines that are used to spray on the food crops.*
3. *Precautions taken to prevent the spoilage of food grains.*

Activity : 1.4

Visit the site of a building construction. Make a list of the important building materials used.

SCIENTIFIC METHOD

Scientists follow certain methods to solve problems. This systematic approach to solve problems will better suit not only in laboratory work but also in our daily lives. For example, let us see how doctors examine a patient.

First, the doctor enquires the patient about the symptoms of his health problem. Then, by asking relevant questions, the doctor collects data about the patients previous days activities and the foods that he/she has taken. The doctor records the patients temperature and heart beat, using a thermometer and a stethoscope. From the data collected, the doctor arrives at certain conclusions about the disease. If necessary the doctor confirms these conclusions through blood test, urine test and X-rays. On the basis of the findings, the doctor prescribes suitable medicine and diet.

Activity : 1.5

Collect three types of seeds-grams beans and paddy. Let your problem be to find out suitable conditions which are necessary for these seeds to germinate and grow into plants.

To solve this problem, collect the following data:

i) *Take six wooden or cardboard boxes. Fill three of them with sand and three of them with soil.*

ii) *Sow each of the three types of seeds in each of the sand and soil boxes and water them.*

iii) *Note down the time taken for each of the seeds to germinate. Water them periodically.*

iv) *When they start growing into plants, observe and notedown the differences, between the plants grown in sand and plants grown in soil.*

v) *Take a box containing plants and keep it inside the house for a couple of days. Observe the changes.*

vi) *Add a little fertilizer to the plants grown in sand. Observe its further growth for a few more days.*

After conducting the above mentioned experiment, answer the following questions, with the help of the data collected:

i) *Do all the seeds germinate at the same time?*

ii) *Do plants grow better in sand or in soil?*

iii) *What differences do you observe between the plants which are kept outside the house and which are kept inside the house?*

iv) *What is the effect of adding fertilizer to the plants grown in sand?*

This sort of a systematic method followed to solve problems is called the "Scientific Method". The steps followed in this method are mentioned below:

1. Identification of the problem.
2. Collection of all relevant data regarding the problem.
3. On the basis of the data, arriving at some opinions or hypothesis, about the problem.
4. Testing these opinions or hypothesis by experiments and drawing conclusions.
5. Solving the problems on the basis of the conclusion.

LIMITATIONS OF SCIENCE

Though wonderful progress has been achieved through science, many more problems are yet to be solved. Deadly

diseases like small pox and plague have been eradicated. But effective medicines to cure cancer and A.I.D.S. are yet to be discovered. Though there are many benefits from the industries, the smoke, chemicals and the waste given out by the industries have created a new problem of environmental pollution. Environmental pollution has an adverse effect on our health and breeds new diseases. Satisfactory remedies to these problems are yet to be found.

CONTRIBUTION OF SCIENTISTS TO THE DEVELOPMENT OF SCIENCE

Scientists all over the world have contributed to the development of science. The use of their discoveries and inventions are not confined to the nations to which they belong. People throughout the world have been benefited by them.

Right from the time microscope was invented, a systematic research on micro-organisms is being conducted. This systematic research on micro-organisms has helped to cure many diseases. Alexander Fleming discovered penicillin. This medicine can cure many diseases caused by bacteria. The medicine has saved many lives.

Edward Jenner discovered vaccination against small pox. By the use of this vaccine, small pox is completely eradicated in most parts of the world.

Louis Pasteur evolved a process called pasteurisation. This process is adopted to preserve milk from spoiling. This is done by heating and cooling it.

Rabies is the deadly disease caused by the bite of mad dogs. Louis Pasteur discovered a preventive vaccination against rabies.

Thomas Alva Edison invented the electric bulb and gramophone.

Michael Farady helped the world to know about electricity.

Jagadish Chandra Bose showed that plants also have life and react to stimuli as we do.

Aryabhatta and Srinivas Ramanujam have contributed to mathematics which in turn has helped science to develop.

Sri C.V. Raman was awarded Nobel Prize for his important research on light.

India has achieved progress in the field of atomic energy and satellite launching by the contribution of Homi J. Bhabha and Vikram Sarabhai.

Exercises

1. *What are the steps of scientific method?*
2. *When the cycle tube gets punctured, it is taken for repair. Identify and write the steps of scientific method in the procedure followed by the repairer.*
3. *Identify and write the steps of scientific method followed by your mother in cooking.*
4. *Some people observe rituals during eclipses. Find out the reasons for this. Examine and write whether those reasons agree with the scientific method.*
5. *Name the diseases for which effective medicines are yet to be found.*
6. *Who discovered vaccination for the disease caused by the bite of mad dogs?*
7. *Arrange a debate in your class about the benefits and harmful effects of science.*

Chapter - 2

THE THINGS AROUND US

There are a variety of things in our surroundings. There are cars, aeroplanes birds,insects and animals. These are trees, shrubs, creepers and different types of flowers and fruits. There is air, sunshine and water. There are twinkling stars in the night sky.

How are these things different from one another? How do they resemble each other?

Some of these things have colours while others are colourless. Some are small, while others are big. Some can be seen and others cannot be seen. For example, we cannot see air, but its presence can be felt. Some are living beings and some others are non-living. Like this, it is possible to group them on the basis of certain properties. This is called "Classification".

Take for example school books. They can be classified into text books and exercise books or they can be classified as language, science, history and mathematics books.

In the same way, how can we classify marbles with which children play?

i) On the basis of colour, red, green and yellow marbles

ii) On the basis of size; marbles of the same size, small or big sizes.

iii) On the basis of both colour and size, they can be classified into marbles of the same size and same colour.

CLASSIFICATION OF SUBSTANCES

Substances can be classified into many groups, based upon their properties.

Activity : 2.1

Classify the following animals in your own way and state the basis of your classification: Cat, Cow, Dog, Frog, whale, Fish, Sparrow, Parrot, Crow.

Activity : 2.2

Classify the vegetables: beans, potato, cucumber, sweet potato, ladies finger, radish in your own way and state the basis of your classification.

Compare your classification used in the above activities with those of your classmates.

Activity : 2.3

Classify the following food substances according to their origin; plant source or animal source: rice, ragi, jowar, ghee, meat, pulses. Classify the same items into carbohydrates, fats and proteins.

Matter consists of several materials. Any thing which we can see, touch, smell or taste or feel is called matter. What are the main characteristics of matter?

Activity : 2.4

Take a measuring jar, half filled with water. Note down the water level. Into this water, immerse a stone with a thread attached to it. Water level rises. Why?

A stone immersed in water displaces an equal volume of water. So the level of water rises. This shows that matter occupies space. Space occupied by a body is called its volume.

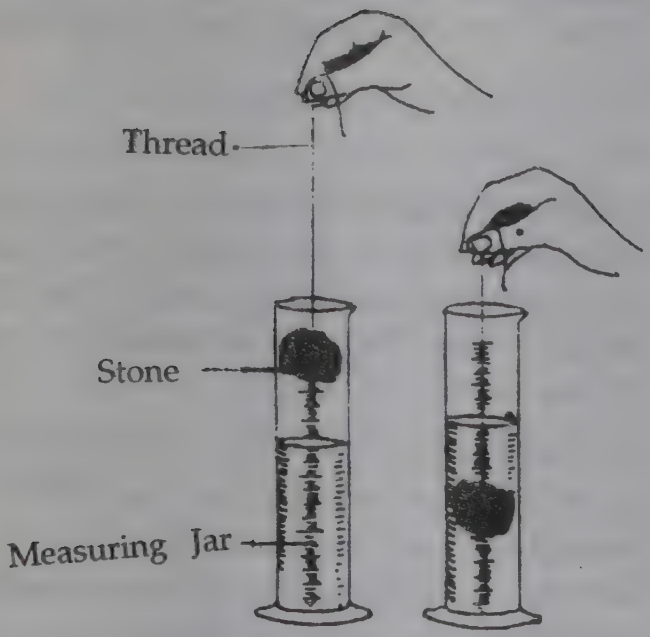


Fig 2.1

STATES OF MATTER

Activity : 2.5

Classify the following into solids, gases and liquids - Kerosene, wax, water, oxygen, ice, mercury (present in the thermometer) and steam.

In our surroundings, there are solid, liquid and gaseous substances. These indicate the three states of matter. The states of matter can be interchanged. Take for example, ice, It melts into water.

Water can be converted into steam by heating. Steam condenses into water, water becomes ice on cooling.

Activity : 2.6

Take the following substances and put them into a vessel containing water "A piece of stone, a piece of wood, a piece of glass, a piece of plastic, an iron nail, a rubber band". Some of them float, some of them sink. Why?

Activity : 2.7

Take the following substances salt, sand, chalk powder, glucose, baking soda, sugar, blue powder (used to whiten clothes). Take water in a tumbler or in a test tube. Test individually, which of the above substances is soluble in water. How do you know whether a given substance is dissolved in water or not?

Some substances are soluble in water. They mix with water and become invisible without leaving any residue. When a substance like sand is added, it settles down. Thus, insoluble substances do not become invisible. They form a residue. Hence, substances can also be classified on the basis of their solubility in water.

Activity : 2.8

Take the following substances-glass pieces, iron nails, pins, one rupee coin. Bring a magnet near each of these substances. Which of them get attracted towards the magnet?

Some substances get attracted towards the magnet and some do not. On the basis of this property also, substances can be classified.

Living beings can be classified into plants and animals.

ELEMENTS

You might have seen sugar getting charred, when it is heated. The black substance left behind when sugar is heated is carbon. Apart from carbon, sugar also contains two more substances - namely, oxygen and hydrogen in combined state.

When electric current is passed through water (To which few drops of an acid are added) two substances namely oxygen and hydrogen are obtained. Water is formed by hydrogen and oxygen.

Many substances that we see are made up of some other simple substances. When water decomposes, oxygen and hydrogen are obtained, Water, therefore is not a simple substance. It is not possible to get different substances from oxygen alone. Oxygen, therefore is an element. An element cannot be divided into simple substances. There are 92 naturally occurring elements. Carbon, sulphur, oxygen, hydrogen, nitrogen, iron, mercury etc. are examples of some elements.

Substances formed by the combination of the elements are called compounds. Sugar, salt, water and sand are examples of some compounds. Thus, substances around us can also be classified into elements and compounds.

Among the elements, some are metals and some are non-metals. Metals usually have these properties. They conduct electricity. They have a shining surface. It is possible to make fine wire and thin sheets out of many metals, but non-metals do not have these properties.

Many elements occur in nature only as compounds and a few occur in their natural state as elements.

For example, the elements sodium and chlorine occurs as compounds, whereas the elements gold and oxygen occur as elements in nature.

The common salt that we use is a compound called sodium chloride, made up of two elements, namely, sodium and chlorine.

Activity : 2.9

Make a list of elements and compounds present in air.

ATOMS AND MOLECULES

When a drop of red ink is added to a glass of water, the whole water turns red. The drop of ink spreads through out the water in the form of small particles.

When a spoonful of sugar is added to a glass of water, sugar breaks into small particles and spreads throughout water. The whole of water tastes sweet. In this way, substances can keep breaking up into very fine particles. After reaching a particular stage further division of these particles is not possible. The smallest particles of a substance obtained by physical division is called a molecule. A molecule of a substance will posses almost all the properties of the substance.

The substances can be found in the form of a compound or an element. Molecules of the substances are made up of still smaller particles called atoms. The molecules of a compound consists of atoms of different types. For example, a molecule of water consists of one atom of oxygen and two atoms of hydrogen, but the molecules of an element consists of the same type of atoms. For example, in a molecule of oxygen, there are two atoms of oxygen.

Atoms of the same elements are alike and the atoms of different elements are different.

Though the molecules of a compound are alike, they are made up of different atoms.

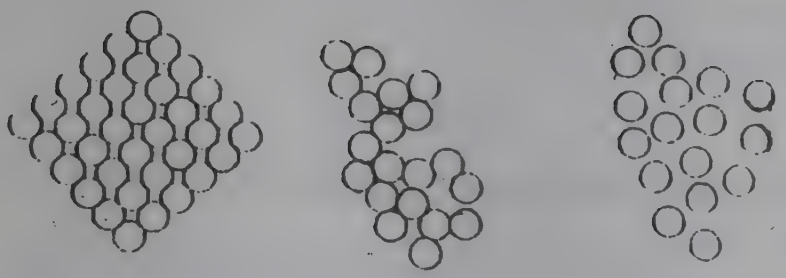


Fig 2.2: Arrangement of molecules in solid, liquid and gaseous state

Molecules of different compounds, are different from one another. For example, a molecule of sugar is different from a molecule of water.

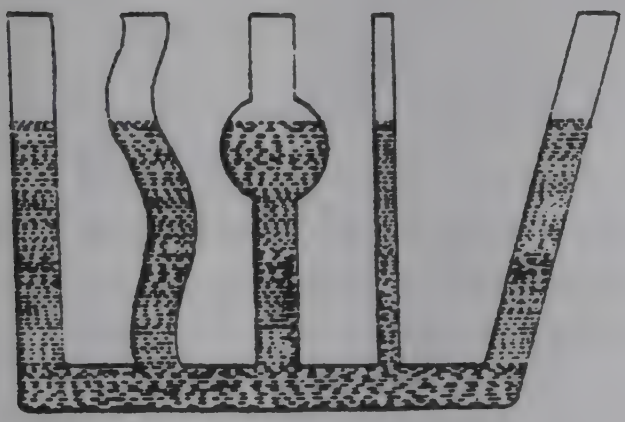


Fig 2.3: Liquid takes the shape of the container

You have already studied that matter exists in three states namely solid, liquid and gas. The differences in the arrangements of molecules is the reason for the different states of matter.

In solids, molecules are closely packed. They are not free to move. As a result, solids have a definite shape. In liquids, the

molecules are separated by a distance which enables them to move. So, they flow and take the shape of a container. In gas, the molecules are free to move in all directions, and occupy the available space.

Exercises

1. *State any three properties of matter that can be used as the basis of classification.*
2. *Classify the following into elements and compounds - sulphur, water, salt, gold, oxygen, sugar, iron.*
3. *Classify the following and state the basis of your classification - Cotton, sugar, wheat, silk, milk, wool.*
4. *In winter, the hardened co-conut oil starts to melt when kept on the palm for some time why?*
5. *Some groups of substances are given below. In each group, there is a substance that does not belong to the group. Write it separately.*

   a) Sulphur, Charcoal, mercury, gold, salt, oxygen.
   b) Sand, sugar, charcoal, sawdust.
   c) Lemon, banana, orange, sweet lime.
6. *How many atoms are there, in a molecule of water?*
7. *What is the difference between the molecule of an element and the molecule of a compound?*

Chapter - 3

SEPARATION OF SUBSTANCES

Before cooking, why is the rice or ragi cleaned?

During the process of separating the corns from crops grown in the field, there is a possibility of small stones and mud particles getting mixed with the food grains. They are removed by hand picking and sieving and food grains are used after cleaning.

After milling food grains, why should the flour be sieved? The flour consist of bran and coarse particles. To remove these impurities and to obtain fine flour, it should be sieved.

Many substances found in our surroundings can be mixtures of different compounds or elements or pure substances. Sometimes we need to separate certain substances from a mixture to obtain what we want. We have to adopt different methods to separate them. For example, Tea is prepared by adding tea leaves, sugar and milk to boiling water. Tea leaves are separated by filtration.

Sometimes, it becomes necessary to find out how much of different substances are present in the mixture. For example, all sugar solutions are sweet. But to know the amount of sugar present in each solution, sugar has to be separated from the solution and the quantity determined.

Activity : 3.1

What is the residue left behind after extracting oil from the ground nuts? How is the residue useful?

Method of separating different substances from mixture

While cleaning rice, how do we recognise stones, mud and other impurities mixed in it? They are easily recognised by their colour. This property helps in their separation. Suppose we have soji and flour mixture. We are asked to separate them. Soji has bigger particles than flour. Hence the difference in the size of the particles help in their separation. We use a sieve and separate.

Some of the properties of the ingredients of a mixture help in the separation of the mixture.

Activity : 3.2

During the harvest season, when farmers thrash the food grains

in the wind, grains and the bran fall into separate heaps.

In the rice mill, rice and husk fall into separate groups. As the rice grains are heavier than the husk, separation is not difficult.

The lighter ingredients of the mixture are carried away by the force of the wind and got separated from the heavier substances. This method of separation using wind force is called "Winnowing".

Activity : 3.3

Separate a mixture of sand, dust and water by using a filter paper.

We know that water mixed with sand or mud can be separated by decantation.

Can we separate a mixture of two liquids which do not mix up with one another by the method of decantation?

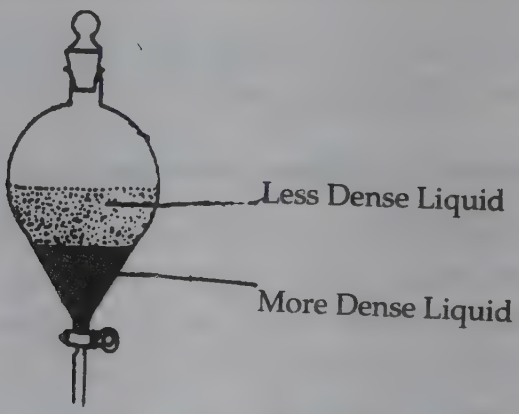


Fig 3.1 Separating Funnel

Activity : 3.4

Prepare a mixture of water and groundnut oil in a beaker filling about a quarter. How do we separate this mixture?

Observe the mixture. We find that there are two layers of liquids. Which liquid is found in the upper layer? Why?

The mixture can be separated by using a separating funnel.

The mixture is poured into funnel. Oil collects at the top layer and water at the bottom. Water is taken out into a beaker with the help of the tap. The tap is closed when the line of separation of the two layers reaches the tap.

Activity : 3.5

When iron nails falls down and mixed up with the mud, how can we pickup. Can you suggest a method of picking out the nails?

Substances made from iron get attracted by a magnet. Nails made of iron can be separated by using a magnet.

Activity : 3.6

Dissolve a spoonful of salt in a glass, half filled with water. Place ten drops of the solution on a plate and expose them to the sunlight. After about an hour, observe the plate. What do you find? What happened to the water of the solution?

Thus it is possible to separate a dissolved substance from its solution by evaporating the solvent (water). This method is called evaporation.

To obtain salt from sea water, evaporation technique is used. Sea water is collected on the sea shores in small beds and exposed for several days? Water gets evaporated by sunlight and wind, leaving behind the salt.

Evaporation process can be quickened by heating. In the laboratory salt solution is heated to separate salt from the solution.

Drinking water obtained from a tap or well has a particular taste. Water from some places is salty. This is due to the presence of dissolved salts in it. Sometimes we need water which is free from these dissolved substances. For example, while preparing medicines, very pure water is required.

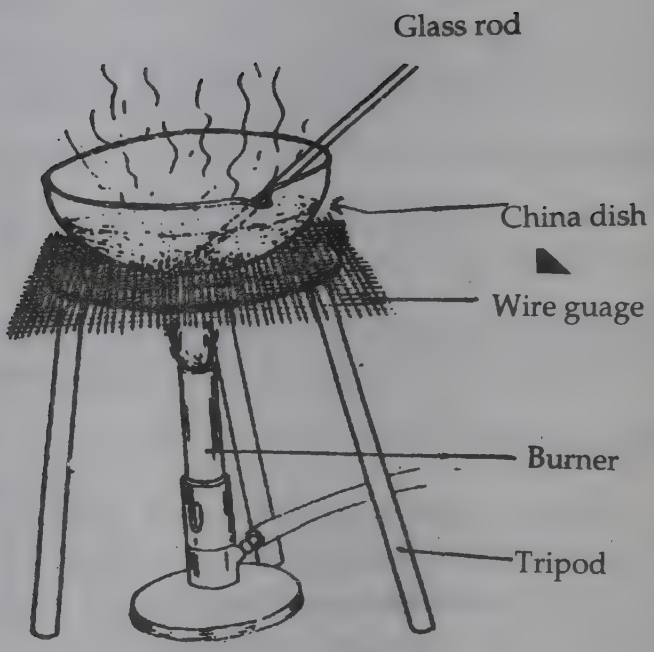


Fig 3.2: Evaporation

Activity : 3.7

Pour out a tumbler full of water into a clean vessel. Keep it on a heater and boil. Cover the vessel with a clean plate. Put off the heater after sometime. Allow the water to cool. Remove the plate and observe its bottom. What do you find?

Collection of water drops are found at the bottom. Taste these drops. How are these drops formed?

Pure water has no taste. Water present in the vessel is converted into steam by heat. Steam cools and condenses as drops at the bottom of the plate. Water obtained by this method does not contain anv impurities.

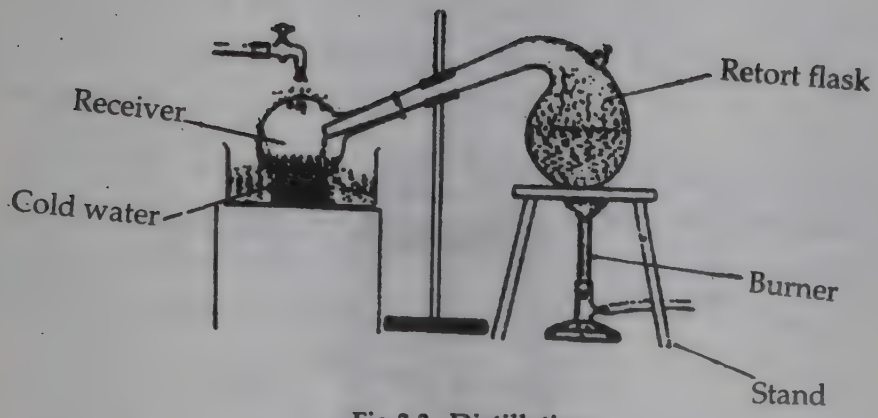


Fig 3.3 : Distillation

The method of obtaining a liquid in a pure form of cooling its vapor is called distillation.

Activity : 3.8

Take a conical flask half filled with water. Colour the water by adding a few crystals of potassium permanganate. Fix a delivery tube to the flask.

At the other end of the delivery tube, keep a test tube surrounded by cold water as receiver.Now heat the flask and boil the water. Water changes into steam which passes through the delivery tube and gets cooled, and becomes water at the receiver. The pure water collected in the test tube is called 'distilled water'. Does this water has the same colour as that of water in the flask. Why?

We know that solid changes into liquid state and liquid changes into gaseous state, by heat. But there are exceptions. Some solids directly pass on to gaseous state by heat and when the gaseous matter is cooled, they directly turn into a solid. Such substances are called "sublimates". If a mixture contains sublimates, they can be separated by sublimation process. Camphor, iodine, napthalene are examples of some substances that sublime.

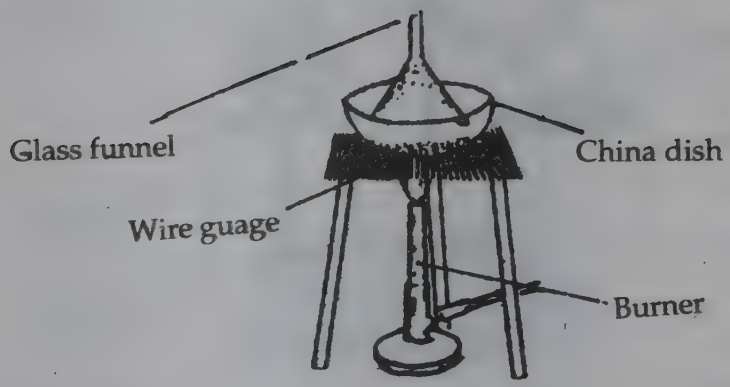


Fig 3.4: Sublimation

Activity : 3.9

In a glass half-filled with water, go on dissolving salt and prepare a solution which cannot dissolve any more salt. Transfer this solution to a china dish and keep it without disturbing. After a few days, small crystals of salt can be seen. Compare these crystals with those at home. What do you observe?

Activity : 3.10

Prepare a solution of alum as above, in hot water, in a glass tumbler. Cool the solution without disturbing it. After sometime, beautiful crystals of alum can be obtained.

Activity : 3.11

Observe crystals of sugar. Among them, some are small and some are big. Observe their shape. How do they look like?

The method of obtaining a dissolved substance from a solution in the form of crystals is called "Crystallisation". In crystallisation, the solution should be cooled slowly,

Sometimes, to separate a mixture, more than one method has to be employed.

For example, the salt we buy from the shops may contain some impurities like mud and sand. From such a type of salt, how can we obtain pure salt? What are the steps followed for this purpose?

First, salt should be powdered and dissolved in water. Salt dissolves in water, while sand and mud remain undissolved. When the solution is filtered, sand and mud are separated. The filterate is evaporated to obtain pure salt.

Exercises

1. *State the method of separating the following mixtures:*
   i) Iron filings and salt
   ii) Sand, salt and ammonium chloride
2. *What is distillation?*
3. *What is sublimation? Explain.*
4. *How do you separate a mixture of mustard oil, water and sand?*
5. *Give examples of mixtures which contain useful ingredients only.*

Chapter - 4

MEASUREMENTS

All of us use measurement in our daily life. Measurement can be of different kinds. For example, to measure Volume, we use litre. We send our child to buy a litre of milk or half a litre of oil.

To measure mass,we use kilorgram. When we buy rice, we buy it in kilos and kgs as is popularly called. We buy hundred grams of sugar. A gram is one thousandth of a kilogram.

To measure length, we use the metre. We buy two metres of cloth. A pencil is about 7 centimetres long, we say. A centimetre is a hundredth of a metre.

To measure temperature, we use a thermometer which tells us the temperature in degrees. We say grand father has got fever. His temperature is 38°C (thirty eight degrees celsius).

And we measure time by hour, minutes and seconds. We say that the school starts at 10.30 A.M. The bus is late by twenty five minutes. His watch is thirty seconds behind time.

Activity : 4.1

Prepare a list of two situations where different measurements are used in daily life.

Study the 4 lines shown in fig. 4.1 which two of them are equal in length?

Which is the longest? Which is the shortest? But without a standard with which we can compare, it is difficult to decide accurately. The decision taken by using eyes alone will not be accurate and might even go wrong. To decide accurately which is longer, shorter or equal. We have to compare one with another by using a standard.

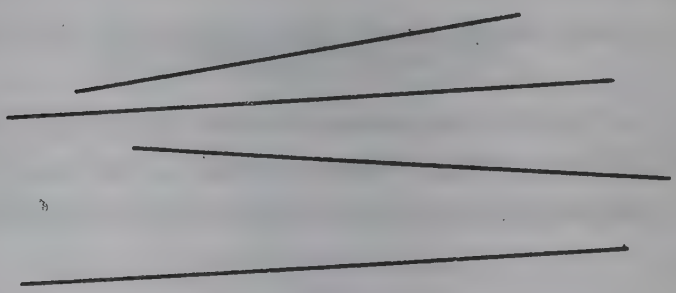


Fig 4.1

Common measure.

If we have a standard system of measurement accepted by all, measurement of length would be done accurately by everybody.

A unit which remains the same, no matter when and by whom it is used is called a standard.

The standard of measuring length

The distance between two marks, on a platinium-irridium Alloy bar kept at the International Bureau of Weights and Measures in the French town of Serves near Paris has been accepted as a standard of length. The distance between the two marks is called the 'metre'. A similar bar which is a copy of the International standard is kept in the National Physical Laboratory, New Delhi.

Metre scales used all over the country are compared and made equal to this standardized length.

On many occasions, while measuring length, we may have to measure a length of less than a metre.

Some times we may have to measure distances much longer than a metre.

In order to measure shorter distances than a metre sub units of a metre are used; and multiples of a metre are used to measure distances larger than a metre. These are given in the Table 4.1.

Table 4.1

10 milimetre (mm)	=	1 centimetre
10 centimetre	=	1 Decimetre
10 Decimetre	=	1 metre = 100 cm or 1000 mm
10 Metre	=	1 Decametre
10 Decametre	=	1 Hectametre
10 Hectametre	=	1 Kilometre (km) 1000 M

Activity : 4.2

Match the items listed under column A with the standards to measure them listed under column B.

SL. No.	A	Sl. No.	B
1.	*The breadth of the play field*	1.	*Millimetre*
2.	*The distance between Hubli and Dharwad*	2.	*Centimetre*
3.	*The thickness of the metre scale.*	3.	*Metre*
4.	*The length of a piece of chalk.*	4.	*Kilometre*
		5.	*Decimetre*

To measure the length using a scale

The length on a metre scale is divided into 100 equal parts. Each part is called a centimetre. Each centimetre is further divided into 10 equal parts called millimetre. Millimetre is the smallest distance we can measure with the scale.

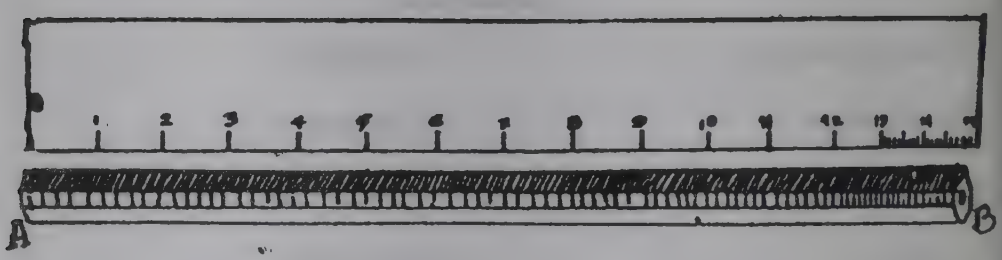


Fig 4.2

To measure the length of a pencil, place the scale with its edge along the pencil as shown in the figure. Slide the scale along the pencil so that the edge of the pencil A coincide with 'O' cm mark on the scale. Read the division on the scale coinciding with the other end B. Let us say the end B lies between the 14th and 15th cm marks. Further, we find that B lies on the 8th mm mark, then the length of the pencil is 14.8 cms.

Errors in measurement

Any measurement should be accurate. Hence it is necessary to be careful in taking reading on the scale.

1. While taking reading on the scale, they must be placed vertically on the reading.
2. If the end of the scale are worn out, measurement may be started from the next cm mark.

Activity : 4.3

Take a piece of thick twine (or a white tape). Borrow a metre scale or measuring tape from your teacher. Place the twine or tape beside the scale and mark cm markings with ink. With the help of this scale, find the height of ten students. List the heights with their names in the descending order. Who is the tallest and who is the shortest among them?

To measure a curved line

If the length to be measured is not that of a line but a one-rupee coin or a ball, how do we measure their diameter with a metre scale? For this, two wooden blocks besides the metre scale are needed.

Place the coin or the ball in between two wooden cubical blocks. Measure the distance between the edges of the blocks

using a scale. This gives the diametre. Refer Fig 4.3

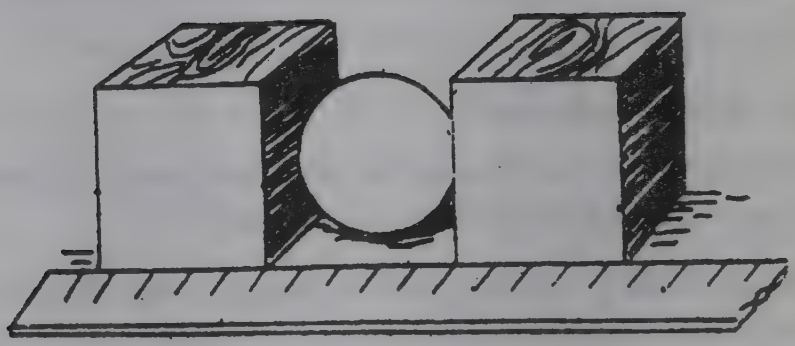


Fig 4.3

Measurement of Area (i) regular bodies

The surface area of a square or rectangle is the product of the length and the breadth of the surface.

length x breadth	=	area
metre x metre	=	square metre $(m)^2$
cm x cm	=	sq. cm $(cm)^2$
mm x mm	=	sq. mm $(mm)^2$

Therefore, area should be expressed in square units. If it is the area of large field or a forest it is expressed in multiples of square metre.

100 sq. metre	=	1 Are
100 Ares	=	1 Hectare (10000 sq.m)

Activity : 4.4

Write the surface areas of the items in the list given below in sq. cms or sq.m.

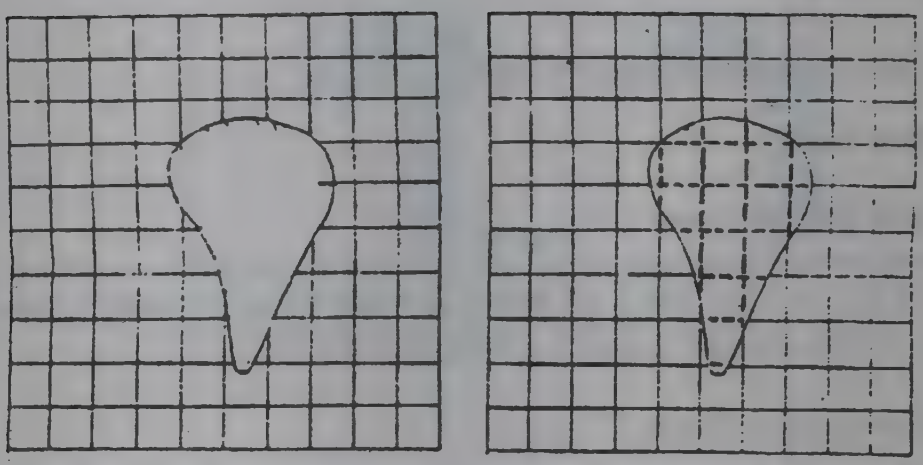
Sl. No.	Length x Breadth =	Surface area
1. Post Card		
2. A page from your science text book		
3. Black board		
4. Floor of the classroom		

Find out the areas of triangular and spherical objects using proper formulae (get assistance from your teacher).

(ii) Irregular objects

To find out the areas of objects without a regular shape, for e.g., leaves, petals etc., there are no formulae. Graph sheets could be used in such cases to calculate the surface areas. Suppose, you have to calculate the surface area of hibiscus petal. Spread the petal on a graph sheet as shown in fig. 4.4. Trace the outer margin of the petal on the graph sheet using a pencil [fig. 4.4 (a)]

Remove the petal off the graph sheet. It's shape will be as fig : 4.4 (b). Count the number of complete squares within the outline of the petal. In the same way count the half and more than half squares - they will be respectively 7 and 6. Still some more squares in the outline of the petal are less than half-a-square. These are not included while counting. The area of the petal is (7 + 6) = 13 square units.



(a) (b)

Fig 4.4

Activity : 4.5

1. *Find out the area of four leaves from the plants belonging to different families.*
2. *Find out the area of four different leaves of the same plant. What do you learn from this?*

Measurement of Volume

Objects, whatever their form may be - solid, liquid or gas, occupy space. The size or quantity of space occupied by objects is their volume.

Liquids

Liquids do not have a definite shape like solids. Their shape

will be the same as that of their container. Study the instrument used to measure milk, cooking oil etc.

The basic unit of volume is called a litre.

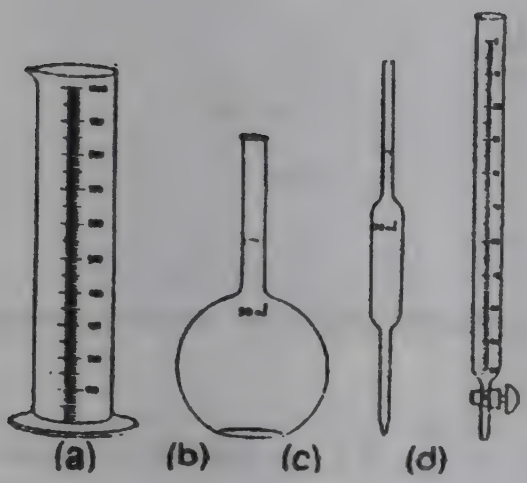


Fig 4.5

a) Measuring Jar
b) Standard flask
c) Pipette
d) Burette

One cubic centimetre means the volume of water that can fill a container that is one cm long, one cm broad and one cm high. The total volume of one thousand cubic centimetres of liquid is called one litre.

1 litre = 1000 cubic centimetre
1/1000 of a litre = 1 cubic centimetre

Measurement of Mass

Objects with more mass become heavier. Mass, needs to be measured accurately. The basic unit of mass is one kilogram.

We need its sub units and multiples. They are given in Table 4.3

Table 4.3

1 kg	= 1000 g
1/2 kg	= 500 g
1/1000 of kilogram	= 1 g
100 kg	= 1 quintal
100 quintals	= 1 ton

Activity : 4.6

Write the multiples or sub units of kg - used to denote the mass of the items listed below.

Sl. No.	Object kg.	Kg	Multiple	Sub unit
1.	Fire wood			
2.	Rice/Wheat/Jowar			
3.	Sugar			
4.	Cardamon			
5.	Saffron			
6.	Gold			

A variety of instruments are used to measure mass. These are called balances.

Vegetable vendors make their own balance. You can also make one.

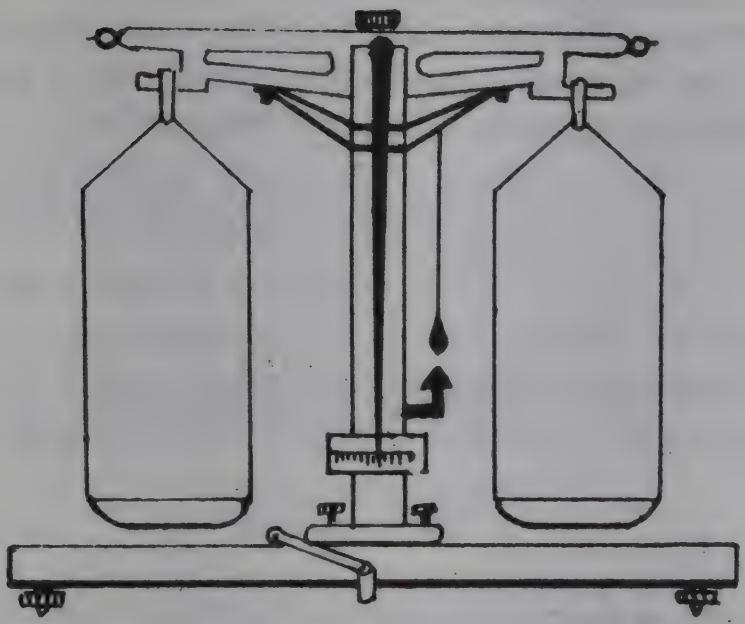


Fig 4.6 Common Balance

Activity : 4.7

Take a scale. It has marking from 'O' cm to '30' cm. The mid point of these two is '15' cm. Drill 3 holes one each at '0' cm, 15 cm as well as at 30 cm mark so that all the three are in the same line. Introduce a thread through the hole at 15 cm and tie a knot. Take two plastic or tin lids that have holes at equal distance on the rim. Introduce three threads of the same length one in each hole and tie them in a knot. Hang the plates, one through each hole at 0 cm and 30 cm respectively. Now your balance is ready.

Only a balance is not enough to find out the mass. We know that kg, is the basic unit to measure the mass, we use the kg to compare its multiples and sub-multiples with objects to find their mass.

Suppose we go to a shopkeeper to by $1\frac{1}{2}$ kg of sugar. He places the 1 and 1/2 kg of sugar. He places the 1 and 1/2 kg

weights in the left pan of the balance. He starts filling sugar little by little on the right pan. When the mass of the sugar in the right pan becomes equal to the mass of $1\frac{1}{2}$ kg weights in the left pan, both the pans will be on the same level.

To know the exact mass of smaller objects, delicate and accurate balances are required. By such balances, masses lesser than even a milligram can be measured. Different objects may have different masses even if the volume is the same. For example, if we take 10 millilitre of kerosene and 10 millilitre of water, they are of equal volume. But their masses will be different.

Activity : 4.8

Keep two measuring jars one in each of the two pans of a balance and see that the pans are at the same level. Pour 10 ml. of kerosene oil into the measuring jar on the life pan. Pour 10 ml. of water into the measuring jar on the right. Are the pans in the same level as before? What do you infer from this?

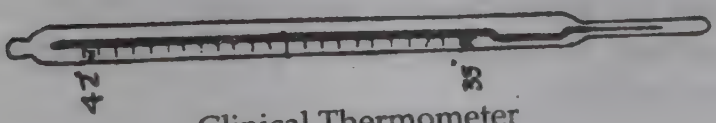
We learn that the masses of two substances can differ even if their volumes are the same. The mass of an object in 1 $(cm)^3$ volume is called its density. From Activity 4.8, we can say that the density of kerosene is less than that of water. When we say that cotton is 'light' and iron is 'heavy' we mean that the density of cotton is less than that of iron. If the same volumes of cotton and iron are taken, iron has more mass than cotton. That is why it appears as heavier than the same amount of cotton.

Activity : 4.9

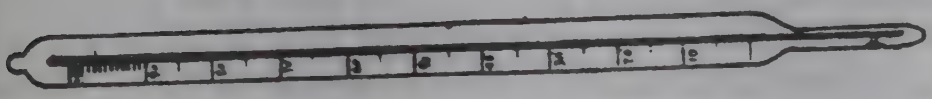
Pour some kerosene into a vessel containing water. What do you see? What is the reason for this?

Measurement of temperature

Boiling water is very hot. Ice is cold. The hotness or coldness is measured by temperature. We say that the boiling water has more temperature than cold water. We measure the temperature using a thermometer. Temperature is the degree of hotness or coldness of a body.



Clinical Thermometer



Thermometer

Fig 4.7

Observe a thermometer commonly used by doctors shown in the fig. 4.7. It is short and is called clinical thermometer. At one end of it, is a bulb filled with mercury. When the bulb is kept in the mouth of a healthy person, due to the body heat, the mercury in it gets heated. Then it expands and moves upwards and stops. When it can expand no more, markings are made on the thermometer to record the position of the mercury. This is read as 37°C That is thrityseven degrees Celsius. This will be the body temperature of the person.

Observe the thermometer used by your teacher. This is longer than the clinical thermometer. Besides, while the clinical thermometer has markings from 35°C to 42°C this one has

graduation to show $0^{\circ}C$ to $100^{\circ}C$ degrees.

When the bulb of the thermometer is kept between melting ice cubes,the mercury becomes cool. It contracts. The level of mercury drops down to $0^{\circ}C$. If the same bulb is kept in boiling water, mercury expands and stops at marking $100^{\circ}C$. At sea level, water boils at $100^{\circ}C$.

Activity : 4.10

Observe the thermometer of your school laboratory. Note down the temperatures shown from morning 10'O clock to evening 5'O clock, every one hour.

Measurement of time

Quick and slow, day and night etc. are words connected with time. But they do not give the exact time. How to measure time? If an activity recurs at a specified time, it can be a basic standard unit. Such standard units of time can be the time from sunrise of this day to the sunrise next day or the time taken by a clock pendulum to oscillate to and fro. You can see two instruments used to measure time in fig. 4.8

Water clock

Hour clock

Fig 4.8

The unit of measurement for time is second. The multiples of time are given in Table 4.4

Table 4.4

60 seconds	-	1 minute
60 minute	-	1 hour
24 hours	-	1 day
7 days	-	1 week
30 days	-	1 month
12 months	-	1 year

In our daily life we will be thinking often, about the measurement of length, breadth, height, area, volume temperature and time. But by using standardised instruments we can avoid confusion and measure them accurately.

Exercises

1. *Write 4 situations where cm is used.*
2. *What instruments are needed to find the length of a zig-zag line? How will you calculate it?*
3. *How will you find out the area of your shadow?*
4. *Match the objects.under A with the descriptions given under B*

Sl. No.	A	Sl. No.	B
1.	Mass	1.	Degree or level of hotness of an object
2.	Volume	2.	Amount of Substance contained
3.	Area	3.	amount of space occupied
4.	Temperature	4.	Amount of space covered

5. *Match A with B*

Sl. No.	A	Sl. No.	B
1.	$\frac{1}{2}$ quintal	1.	2000 gm
2.	5 metre	2.	5000 sq.m.
3.	2 kg.	3.	50 kg.
4.	$\frac{1}{2}$ hectare	4.	500 cm
5.	5 km	5.	50 cm
		6.	5000 m

Chapter - 5

CHANGES AROUND US

Change is a part of nature and occurs all the time. Stars, sun, moon earth changes position. Time changes. Seasons change. Change touches everything. We are all born as babies, grow old and die. A seed grows into a tree. An iron nail rusts. Clouds condense and drop as rain. A glass tumbler when dropped breaks into pieces. But we notice that changes can be different.

When cracker is lighted it bursts instantaneously. But an iron nail rusts slowly. Salt dissolves quickly in water. But rice gets cooked slowly. Paper burns quickly. Milk needs sometime to change into curds. Therefore changes can be classified as slow and fast.

Activity : 5.1

Group these changes, as slow and fast.

1. *Hot glass breaks when drops of water are sprinkled on it.*
2. *A glass tumbler breaks when it is dropped on the floor.*
3. *Sugar dissolves when it is mixed in water.*
4. *A flower gives rise to a fruit.*
5. *Cotton burns when ignited.*

Aspects of Change

We notice that changes can be different. But how do we notice them?

If a bus moves from one place to another, it is a change in position. A rubber balloon expands when air is pumped into it. That is a change in volume. A spring when pulled becomes longer. There is a change in length. When water is heated, it becomes hot. There will be a change in temperature. If it is

heated further it changes into steam. But if we cool water in a refrigerator, it become ice. Sweet sugar changes into sweetless black carbon when burnt. Thus, there are many ways by which we can notice changes.

Activity : 5.2

Notice the change in the following situations and record them:

Sl. No.	Situation	Sign of change
1.	Crystal sugar is stirred in water.	
2.	A fruit drops down from a tree.	
3.	Iron is heated in fire.	
4.	Butter when heated.	
5.	A string is cut when pulled.	
6.	Water is boiled.	
7.	Iron filings are attracted by a magnet.	
8.	Milk changes into curds.	
9.	Milk is spilt.	
10.	A plantain ripens.	

We have all observed the moon. The moon changes its shape from one full moon day to another. All the change that occur during this period will be repeated between the second full moon day to the third and the third full moon day to the fourth and so on.

The changes that occur in the shape of the moon get

repeated in a regular way. Observe the pendulum of a clock oscillating from one end to another.

Consider the following change. Milk changes into curds. Ice melts into water. Here is an important factor in the type of changes. Water when cooled becomes ice. Ice when melted becomes water.

Ice ----------> Water

(Solid) (Liquid)

This is a reversible (two way) change. We can obtain curds from milk but not milk from curds. Such a change is irreversible. In this case, change proceeds in one direction only.

Activity : 5.3

Which of these changes are reversible changes?

1. *Butter changing into ghee.*
2. *Water becomes steam.*
3. *Firewood burnt to ash.*
4. *Wax melting.*
5. *Fruit ripening.*
6. *Rubber lengthening when pulled.*

When we cut a thread, it is divided into two pieces. The long thread becomes two short pieces after this change. But the thread remains as it is. When we pull a rubber strip, its length increases but the rubber itself does not change. Such changes, which do not alter the basic composition of a substance are physical changes.

Instead of cutting the thread, if it is burnt, black ash is obtained. This is nothing but carbon. It doesn't have any properties of the thread. The sweetless carbon obtained after burning sugar is not sugar at all. It is entirely a different substance. Milk changing into curds changes its taste. Rice

turned stale, tastes differently from freshly cooked rice. Such changes are called chemical changes. Changes that occur while milk changes into curds, sugar solution fermenting into alcohol are all included in this category. During chemical change original properties of the substances are lost. New properties are formed.

Activity : 5.4

Which of the following are chemical changes?

1. *Burning Incense sticks*
2. *Breaking a stick.*
3. *Evaporating water.*
4. *Salt dissolving in water.*
5. *Rusting of an iron can.*
6. *Magnet attracting iron filings.*
7. *Iron becoming red hot.*
8. *Boiling of coconut oil*

Two or more objects have to come in contact to result in a change.

Let us examine the examples we have discussed. A stick will not break by itself, if no one tries to break it. The rubber strip will not become elongated if it is not pulled. An iron nail will not get rusted if it doesn't come in contact with oxygen.

Till now we have classified changes based on different criteria. But these classifications are not independent of each other. Let us take the example of milk changing into curds. This can be described as slow or chemical or man made or irreversible (one way) or *controlled change*. In the same way the water evaporating into steam can be classified as reversible (two-way) natural or *controlled change*.

Whenever a change occurs, energy in anyone form is

involved.

When water is poured to quick lime before it is used to whitewash the wall, water boils. The vessel containing it becomes hot. This means that when quick lime comes in contact with water and changes, energy is released in the form of heat.

Activity : 5.5

Take about 10 ml of water in a glass test tube. Touch the test tube. Add some sodium hydroxide to the water and shake. Touch the test tube again. What difference do you feel? What do you infer from this?

You know that energy is released not only in the form of heat but also in the form of light. For example when a candle or fire-wood burns both heat and light are released.

Activity : 5.6

Take about 10 ml of water in a test tube. Add about 4 gms of ammonium nitrate or ammonium chloride to the water and shake well. Feel the test tube again. When you compare this experience of yours with experience in activity 5.5, what do you notice? What do you learn from this.

Activity : 5.7

Pour a few drops of alcohol on your palm. Blow air over it slowly. When the liquid alcohol changes into vapour how do you feel?

Compare your inferences in activities 5.5 and 5.6. Energy is released during some changes and energy is absorbed during some changes.

We all know that energy exists in different forms. When we break a stick energy is used. If we use a torch light powered by a dry cell, it is the change in the dry cell that produces electrical energy.

When a cracker is lighted, energy is released in the form of loud sound, light as well as heat. In displaced iron fillings by a magnet energy is used in the form of magnetic force. Thus, energy is involved in one form or other in every changes that occurs.

Exercises 5

1. *On what basis can you say that a substance has undergone change?*
2. *'A seed changes into a plant' is an example for a slow change. In the same way, list five slow changes.*
3. *What type of energy is supplied to quicken the change from milk to curds?*
4. *Salt dissolves in water. When that solution is heated we get the salt back. To which category does this change belong?*
5. *The same object might undergo physical and chemical changes. Explain with two examples.*

Chapter - 6

MOTION, FORCE AND MACHINES

Motion

There are many objects around us. Hills, pillars buildings, bridges etc., stay where they are. Cars, buses, animals, birds, etc., do not stay still always. They move. We also move while we walk on earth, birds fly in the air, fish swim in water. Ships float on water. Wind also moves. Water flows. Moon revolves around the earth and the earth around the sun.

As the wheel moves, its parts touching the ground go on changing. The parts of the wheel that touch the ground are different at different times.

Kinds of Motion

Will the types of motion be of the same always?

Consider the examples:

A girl is sliding down a slope. A coconut is falling down from a coconut tree. A bullet is fired from a gun. In all these cases, motion is taking place in only one direction. This type of motion is called "Linear Motion".

Observe the direction of the bullock tied to the tread mill. What is the type of motion of the blades of a fan? In all these cases, the objects move around the central point. Such motions are called "Circular motions".

Observe a wall clock. If this were to "work" its pendulum must be moving to and fro. You are familiar with this kind of motion in the previous chapter. This is "Oscillating motion". Observe this type of motion when a hanging object is taken to one side and then released. The movement of a swing, a bell hung to a long chain in a temple etc., belong to this type.

Observe carefully the motion of the minutes hand of a clock. This revolves round once in an hour. Let us presume that this showing the numeral "3" in the clock. This occupies the same position after 60 minutes. This continues as long as the clock is working properly. Similarly, the hours hand makes one complete rotation in 12 hours. The earth rotates around the sun once in about $365\frac{1}{4}$ days. In all these cases, the objects occupy a definite position at a definite interval of time. They take the same time to complete each rotation. Such motions which repeat at regular intervals of time are called "periodic motions".

Activity : 6.1

Play this game. Let four students stand one by the side of

another in the same line in the school play ground. Let there be a fifth student to blow a whistle. When this student blows the whistle, all the four must start to walk fast in the same direction. After two minutes, let the fifth student blow the whistle again. Immediately all the four students should stop. Observe their positions now. Are all the four in the same line now, as in the beginning?

What can be inferred from this activity? At known intervals of time different students cover different distances. Similarly different vehicles, objects, animals cover different distances in known intervals of time. The distance covered in unit time is SPEED. Cars and buses can move faster than cycles. Aeroplanes move with still greater speed. Rockets move with very great speed.

To find out the speed, we have divided the total distance covered by the total time taken.

$$\text{Speed} = \frac{\text{Distance covered}}{\text{time taken}}$$

The unit of distance or length is "metre", and the unit of time is "second". Hence the speed is mentioned as so many "metre per second" or "metre/second".

Distance is measured in kilometres too. Minutes, hour and day are used to measure time. Whenever we mention speed, we must mention the units of distance and time. The statements like the speed of the bus is 40, the speed of rocket is 7 are not complete and do not make any sense. On the otherhand, if one says that the speed of the bus is 40 km/hour, the speed of the rocket is 7 mt/sec, the aeroplace flies with a speed of 800 km/hour etc., we can have a correct information about their speed.

Activity : 6.2

Take a toy motor car. Keep it on smooth ground. Push it a little.

It begins to move. Observe its speed. Now give a slightly great push to it in the same direction in which it is moving. Observe the change in its speed. It will be greater. What is the reason?

When an external force is applied on a moving body in the direction of its movement, its speed increases.

Activity : 6.3

Roll a metal cylinder on the floor. Observe its speed. At the same time, let your friend roll a wooden cylinder of the same dimensions in the opposite direction from the other end. Let them hit each other. After this, observe the change that occurs in the speed of the metal cylinder. Its speed will be lesser, than its earlier speed. What is the reason?

A cyclist applies brakes to decrease the speed of the cycle, you know that the cycle has a circular motion. In which direction is the force applied here?

When a force is applied on a moving body in the opposite direction, its speed decreases.

Force may be push or pull. In these circumstances, there is direct contact between us and the bodies on which we apply force.

To open a door which can easily move to and fro on oiled hinges, a small amount of force is enough, but a larger force is needed to open a door which is held tight by rusted hinges. This illustrate that the direction and quantity of force can be varied depending on the need.

Types of forces

While carrying out the above activity, you have used your muscular force. Which are the other types of forces? Recall what you studied in your previous class. A magnet attracts iron filings. Can you recall when does a plastic comb attract

small pieces of paper? In the first instance, magnetic force is exerted. In the second instance, electric force is responsible for the attraction of small pieces of paper by the plastic comb.

Activity : 6.4

Go to the playground. Throw a stone upwards. Observe it for a few seconds. You will notice that the stone moves upwards to some distance and then it falls down.

The earth attracts the stone towards its centre. You are familiar with this kind of force. You also know that this is called "gravitational force".

Force may be in the form of friction

Activity : 6.5

Throw a cricket ball so that it rolls on a flat mud floor. Observe its motion. The speed of the ball gradually decreases. It moves some distances and then stops. What may be the reason for this?

Does the ball travel the same distance if it is thrown to roll either on a cement floor or on a sandy bed? Conduct the following activity and find the answer.

Activity : 6.6

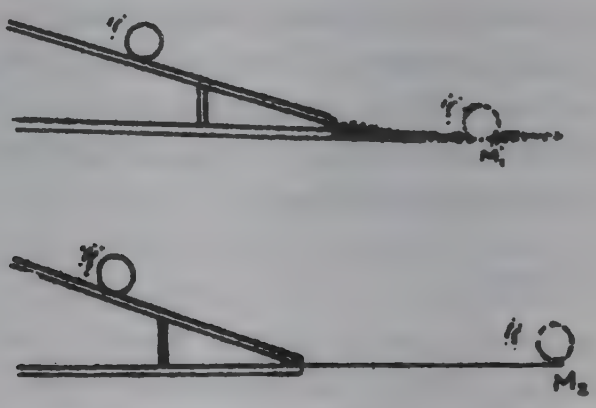


Fig 6.1

See the fig. 6.1 Arrange an inclined plane as shown above on a mud floor. Make a mark at any point on the inclined plane. Allow a cricket ball to roll down from that point. The ball travels some distance on the floor and then stops. Measure the distance travelled by the ball. Let this be M-1

Place the same inclined plane on a smooth cement floor. Take the same cricket ball used earlier. Allow this to roll down from the same height on the inclined plane. Measure the distance travelled by the ball. Let this distance be M-2

Conduct a similar experiment on a sandy bed. Let the distance travelled by the ball in the case be M-3. Compare the three distances. The distance covered by the ball on the cement floor will be the greatest. And the distance covered on the sandy bed will be the least. What may be the reason for this?

The sandy floor offers greater obstruction to the moving ball. This is because of a force that is being exerted on the ball in the opposite direction of its motion. This type of force is called "Frictional force". When the force is exerted, the speed of the moving body gets reduced.

The frictional force of the cement floor is less. That is why the ball travels a longer distance on the cement floor. Suppose we conduct this experiment on a glass floor instead of a cement floor. Would the ball now travel a greater distance or a lesser distance?

The frictional force in this situation, depends on the smoothness of the surfaces of the ball and the floor. As the smoothness of these surfaces increases, the magnitude of the frictional force decreases.

MACHINES

Lever, inclined plane and pulley are simple machines. They are helpful to us in doing work with less effort. You have studied their working in detail in your previous class.

We use different types of levers. You are aware that these levers can be classified into three categories.

Activity : 6.7

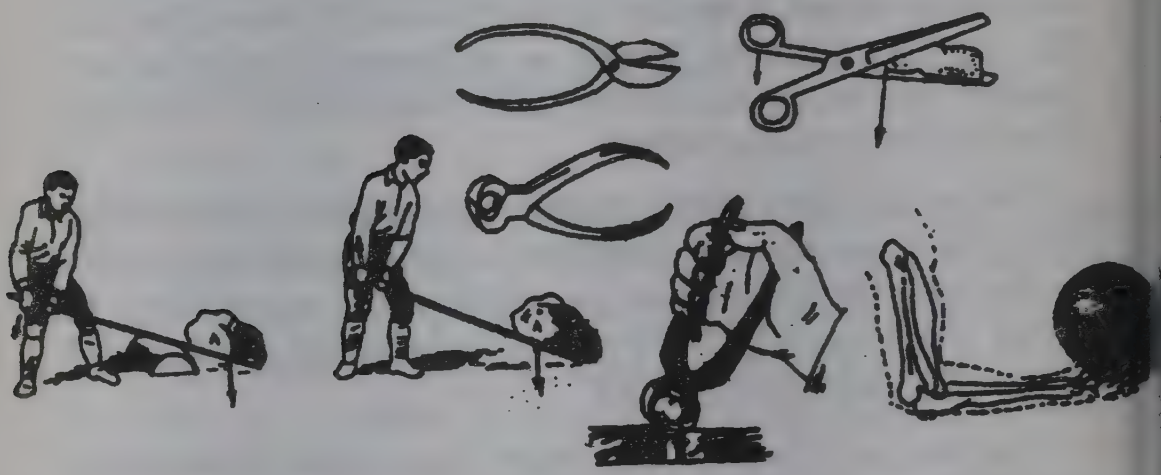


Fig 6.2 Simple machines

Collect pictures of simple devices such as balance, scissors, see-saw, crow-bar, nail puller, ripper, human arm, handle of water pump, nut cracker, door with hinges, spanner, tongs, nail cutter, broom, lemon juice squeezer etc. Examine each of them carefully. Draw their figures in your note book and note down the following two aspects pertaining to each lever:

1. *The position of fulcrum, the point where load and force of pressure (effort) act.*
2. *The directions in which the forces of load (weight) and pressure act.*

In addition to the above, also write the following, suitably in the last column of the table given below:

a) *Which is greater - load or pressure*

b) *One important use of the lever.*

Note: Before filling up the table, study the instruction given at the bottom of the table.

Sl. No.	Name of the lever	Fulcrum is in between load and pressure	Load is in between fulcrum and pressure	Pressure is in between fulcrum and load	Direction of the force of load	Direction of the force of pressure	Important use of lever etc.
1	2	3	4	5	6	7	8

Note: When you are filling up the columns 3, 4 and 5 in the above table, put a "√" mark in the column to which the lever belongs to. In columns 6 and 7 put arrow mark "↑" if the force is acting upwards and arrow mark "↓" if the force is acting downwards.

Examine the above table. We say that the levers of column 3 are of first order, the devices listed in column 4 are levers of second order and those that are in column 5 belong to third order. What reasons do you give to accept the above?

You have studied in your previous class how a pulley and an inclined plane are helpful to man, the pulley fixed at the wall changes the direction of the applied force and thus helps in making the work easy. Imagine a well without a pulley fixed

on it. In such a case you have to draw the bucket full of water upwards. If a pully is fixed, you have to pull it downwards. It is easier to pull downward, than to pull upwards. A heavy weight can be shifted to higher level easily with the help of an inclined plane.

Activity : 6.8

1. *Prepare a list of different places and situations where pulleys are used.*
2. *Find out where the different modifications of an inclined plane are seen and list them.*

WHEEL

There is another simple machine which is familiar to all of us. Infact we use this on many occasion. It is the "Wheel". This is the most significant of all inventions of man. It has played an important role in the development of mankind. Most machines have wheels Importantly wheels help in shifting heavy loads and quickens the movement.

Activity : 6.9

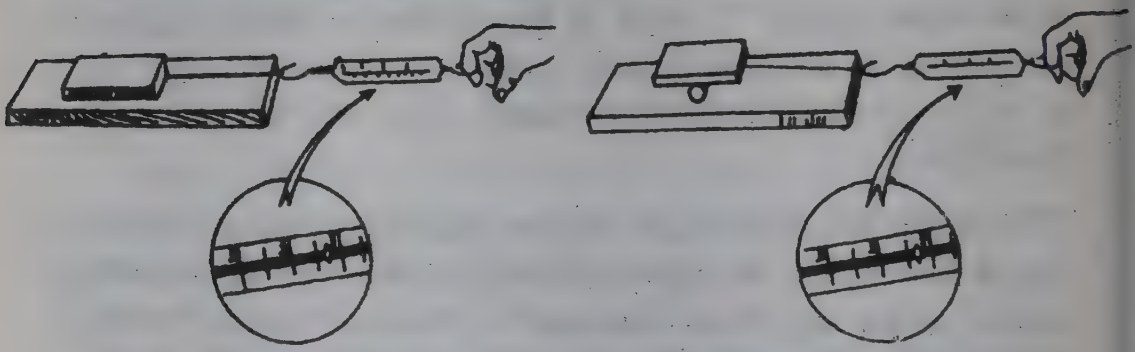


Fig 6.3

Place a brick or a big wooden piece on the ground as shown in the figure. Tie a thread to it. Attach the lower end of a spring balance to this thread. Pull the object with the spring balance horizontally to the ground. Note down the weight or the amount of force as shown by the balance. Let this be F-1.

Take a toy carriage. Its wheels must be rotating freely. If need be lubricate the axles of the wheels. Now take the same object used in the earlier experiment and place it on the carriage or cart. Pull this horizontally to the ground as was done earlier through the spring balance. Note down the weight shown by the balance. Let this be F-2 gm. Weight.

Of these two weights, which will be lesser? F-2 will be lesser than F-1. This means, a lesser force is enough to pull the brick or wooden piece kept on a cart having wheels.

Now can you tell why devices having wheels are used to shift heavy objects from place to place on the ground. Wheels help in the transport of heavy loads with a smaller force.

Do the machines operate on their own?

The simple devices which we have studied so far, do not operate on their own. To function, force should be applied from an external source. The action of the devices depend on the amount of force applied. They change direction in accordance with the direction of force applied.

Activity : 6.10

Prepare a list of objects such as cycle, bullock cart, motor cycle, car, bus, railway engine, flour mill, water pump etc. which you have seen. Examine them carefully. If these were to function, what type of force is needed and from where is it supplied? Discuss.

Vehicles like car, bus, motor cycle have been built in parts which produce energy. With the help of energy by using a fuel like petrol they move.

In the case of the flour mill, the energy producing part, the motor, is outside. Its wheel and the wheel of the motor are linked by a belt. Energy is conveyed from the motor to flour mill through this belt and thus the flour mill works.

Most of the machines are combinations of many simple machines.

Examine a cycle in detail you can find a combination of many simple machines such as lever, pulley, wheel, ball bearings, screws, etc, in it. Most machines are made up of suitable combination of different smaller machines. Energy conveyed from one to another in them through belt chains etc.

Machines require proper care and maintenance.

Machines are helpful to us in many ways. We must take proper care in using and maintaining them.

Simple machines can be used easily; their maintenance is also simple. After use the levers and inclined planes must be cleaned properly. Their axles must be properly lubricated. If not, the friction between the moving parts and the axle make harsh sounds. These parts wear out faster.

Machines should be painted to protect their parts from rusting. They should be protected from dirt and dust. When they are not in use, they must be kept covered. They must not be overused or misused.

Exercises - 6

1. *Define motion.*
2. *Name the four kinds of motion. Give one example for each.*
3. *Mention three effects of force. Give one example for each.*
4. *The distance from Bangalore to Mysore is 140 km. To cover this*

distance a bus takes $2\frac{1}{2}$ *hours. What is the speed of this bus?*

5. *Give one example for each type of force.*
6. *How can a weighing balance be prepared by using a rubber band? Describe briefly.*
7. *Name three types of simple machines. Give two examples for each type.*
8. *How can we say that a cycle is composed of many simple machines?*
9. *How can a pulley help us. Mention two examples where pulley is used.*
10. *How should machines be used and maintained so that they last long?*

Chapter - 7

LIVING WORLD

When we observe our surroundings, we can notice variety of living beings - plants and animals. Every organism has a definite shape and size. They have different structure and colours.How do they differ?

Some animals live on land. Birds and some insects fly in air, while fishes live in water. Frogs and salamander live both on land and in water.

Each organism has a preference in its living surroundings. Birds live on the trees. Honey bees live in hives. Spiders spin webs and live in them. We live in houses.

There are small, big and very big animals. Shapes and sizes of animals differ.

Activity : 7.1

Make a list of different types of animals you know and collect the pictures of animals and identify their names.

Observe the dwelling places of various animals in fig.7.1. You can notice variation here also.

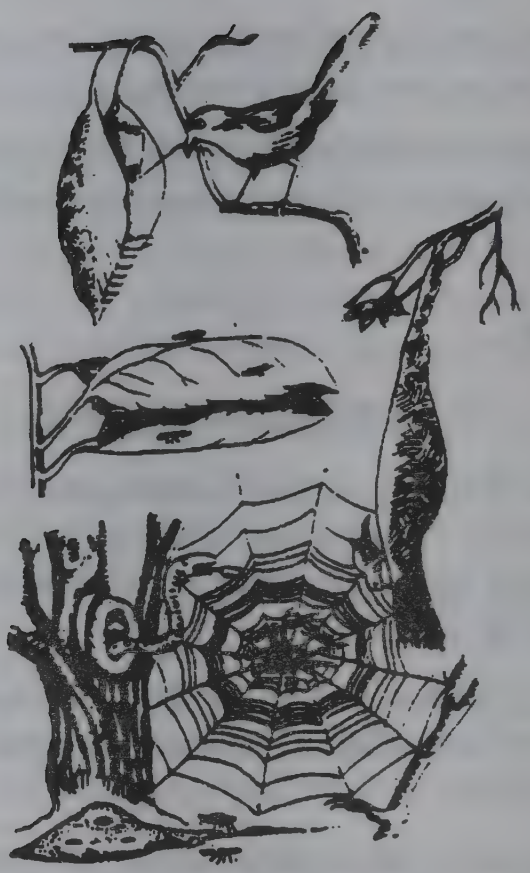


Fig 7.1 : Dwelling places of different animals.

Activity : 7.2

Collect nests of some birds, web of a spider, a bee-hive and nests of some insects. Compare them. What do you understand by this?

Amoeba is an unicellular organism. It is so small that one can't see it with naked eyes. It has no definite shape. We can see an ant with our eyes.

But an elephant is huge. No other animal on land is bigger in size than an elephant. But a whale that lives in sea is bigger than the elephant.

The weight of a whale is equal to the weight of about thirty elephants.

In the same way, we can notice diversity of sizes among plants also. For example, a tomato plant and a banyan tree.

All animals do not feed on the same type of food. Cow, rabbit or deer feed on plants. They are herbivores. Lion, tiger, wolf or cheeta feed on other animals. They are carnivores. Cockroach, cat, dog or man feed on both plant and animal food. They are omnivores. Thus we can group the animals based on their food habits.

Activity : 7.3

Make a list of herbivorous, carnivorous and omnivorous animals.

Sl. No.	Herbivores	Carnivores	Omnivores
1.			
2.			
3.			
4.			
5.			

Just as the sizes and shapes of living beings vary, their way of life and behaviour also vary.

Animals like the earth worm, cockroach, bed bug etc, move away from light. But moths, glow-worms etc. are attracted by

light. Animals which are active during night, eg. owl, cockroaches, etc are called nocturnal animals.

Many scientists thought that they could classify or categorize animals and plant life. For example, a system of naming could be devised on the basis of similarities and dissimilarities in size, shape, behaviour and other life patterns.

A cat gives birth to young ones. Those kittens grow and become cats. So all cats can be grouped to the same species, as they are different from any other, say cow, rat, fish or a tree.

What is species? Species is the basis criteria of classification of living things. According to Linnaeus, a Swedish botanist, species means animal or plant of a particular kind which shows basically many similar characteristics and breed among themselves different from all others. But cats can be of different kinds! There are the Siamese cat, the Indian cat, the Jungle cat, etc. Therefore species also are subdivided into other groups like class, order, family and genus etc.

Accordingly, scientists all over the world have observed plant and animal life in great detail and have classified them. Every plant and animal has a particular scientific name. This scientific name is kept the same all over the world. For example, the scientific name of man is "Homo-sapiens". "Homo" is genus, "sapien" is species. The scientific name of every organism has two words.

Scientific names of some animals and plants:

1.	Cat	-	Felis-domestica
2.	Lion	-	Felis-leo
3.	Mango	-	Mangifera-indica
4.	Radish	-	Raphanus-sativus

Both living beings and non living things have same common characteristics. All things are made up of matter. They have mass and occupy space.

You already know that living things exhibit characteristics like respiration, digestion, growth, excretion, reproduction and response to stimulus. These are not exhibited by non-living things.

There are some basic differences between living and non-living things. For example, a living thing moves by itself. A non-living thing can not move by itself.

Activity : 7.4

Make a list of four living and four non-living things.

Sl. No.	Living things	Non-living things
1.		
2.		
3.		
4.		

Write the differences between living and non-living things.

Sl. No.	Characteristics of living things.	Characteristics of non-living things
1.		
2.		
3.		
4.		

Growth

Growth is one of the important characteristics of living things. Food is required for growth. They need energy in order to carry on their activities. Food is a source of energy for all living organisms.

Animals eat food But how do plants get their food. Plants draw water and minerals from the soil through their root system. The green plants prepare their food in the presence of sun-light, with the help of chlorophyll, carbon-di-oxide and water. This process is called "photosynthesis". Photo means light; synthesis is to produce by combining.

Activity : 7.5

Keep a bean seed in moist soil. Water it daily and observe its growth pattern.

Observe the growth of young ones of a cow, hen, goat etc.

Do you find any difference in their growth after two or three months?

Respiration: All living beings respire. Some of the lower animals have no separate organs for respiration. Higher animals have separate organs for respiration.

Example: Fish - Gills

Frog - Wet skin and gills

Reptiles, birds and mammals - lungs

Unlike animals, plants also respire. Leaves respire through stomata. Stem roots and other parts respire through lenticell.

Living beings respire to produce energy for their body function.

Excretion

Removal of carbon-di-oxide, water and nitrogenous wastes like ammonia and uric acid from the body of animals is called excretion.

Response to stimulus

Living things show response to stimulus. When a thorn pricks, you respond immediately by lifting your leg. When a mosquito tries to bite, you suddenly wave your hand.

The pricking of thorn is stimulus and the action taken is the response.

Life-span

Every form of life has a life-span of its own. It is different for different life form.

Average life-span of some animals

1. Man	-	60 to 70 years
2. Crocodile	-	120 to 150 years
3. Horse	-	30 years
4. Squirrel	-	8 to 9 years
5. Rat	-	2 to 3 years
6. Spider	-	20 years
7. Housefly	-	1 to 4 years
8. Moth	-	4 months
9. Dog	-	16 to 18 years
10. Elephant	-	70 to 90 years
11. Leech	-	20 years

Reproduction

Reproduction is another basic characteristic of living beings. Some animals like cat, dog, cow etc. give birth to young ones others, like frogs, snakes, birds and insects lay eggs. Young ones hatch out of eggs.

Among plants, following plants produce seeds. For example Paddy, rice, maize, pea ground nut. In other plants, new plants grow out of their stems for example: rose, croton, hibiscus, jasmine.

Non-green plants like fungi produce spores. Spores develop or germinate to give rise to new plants. For example: mushroom, yeast etc.

Leevwenhock of Holland, observed a drop of pond water under a microscope. He noticed the presence of minute living organisms in that water.

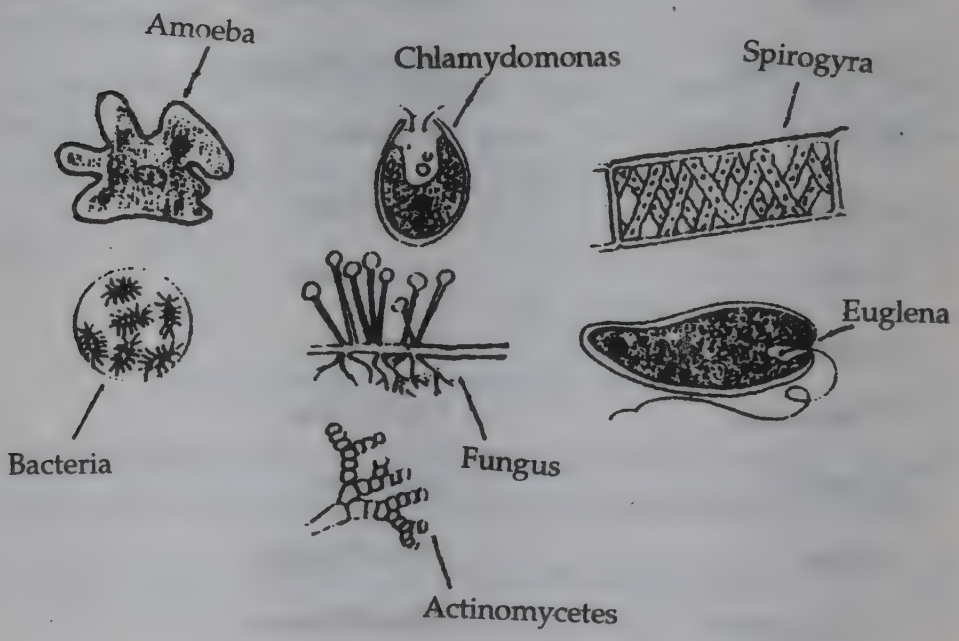


Fig 7.2 : Pictures of minute organisms

In 1665 Robert Hooke of England observed a thin section of cork under the microscope. He noticed that cork is made up of smaller units.

They added up like compact units of a bee-hive to make up the cork section. He called them cells. Cells are the structural and functional units of all living organisms.

A cell is composed of a living substance known as protoplasm. The protoplasm includes nucleus and cytoplasm. The nucleus controls. all the activities of the cell. The cytoplasm is covered by a thin membrane called plasma membrane or cell membrane.

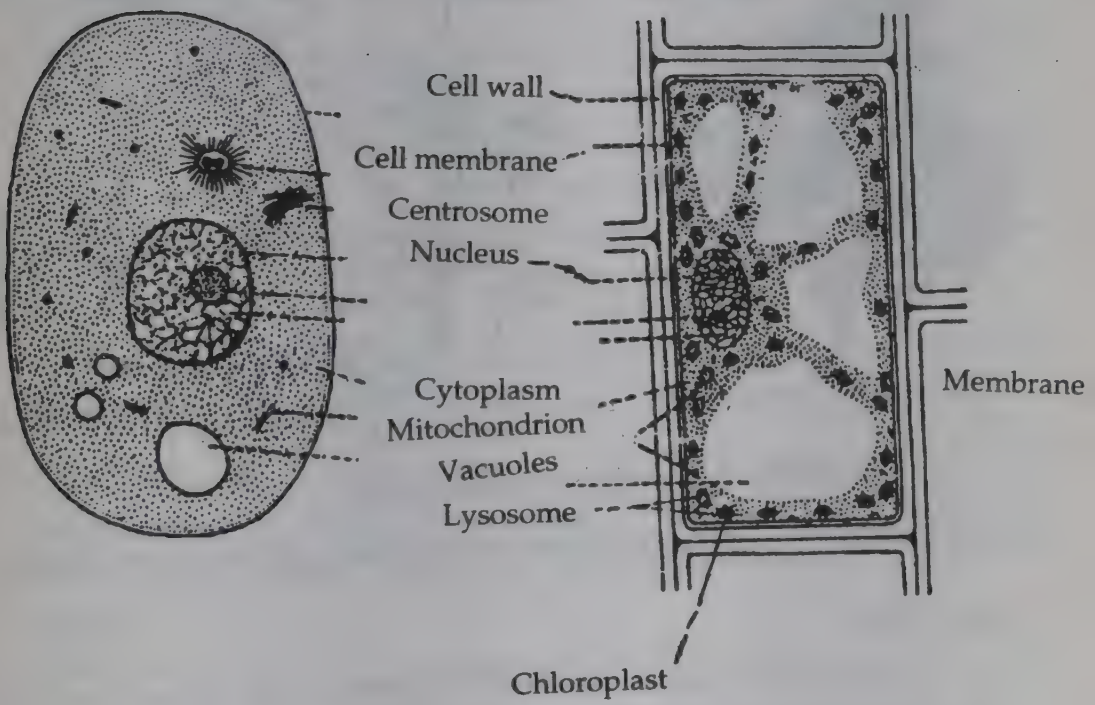


Fig 7.3 : (a) animal cell & (b) plant cell

On the basis of the number of cells in the body, living beings are grouped into unicellular and multicellular organisms.

Activity : 7.6

Make a list of unicellular and multicellular plants and animals.

1. *Unicellular plants ex:*
2. *Multicellular plant ex:*
3. *Unicellular animals ex:*
4. *Multicellular animals ex:*

Plants can be classified into two types. They are (a) flowering plants and (b) non-flowering plants.

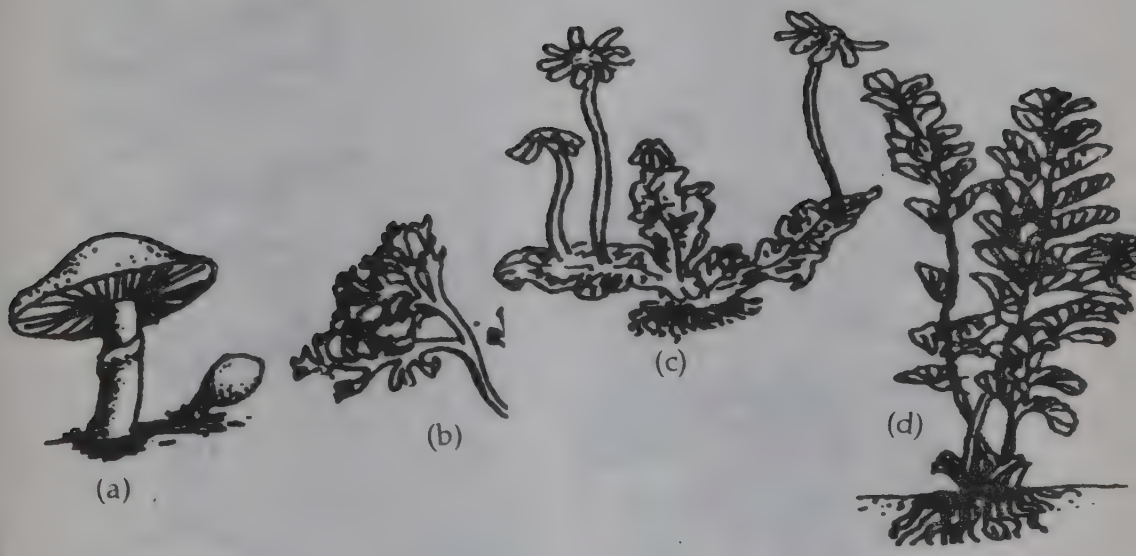
Cotton Lady's finger Sunflower

Fig 7.4 : Flowering plants

Flowering plants have root, stem, leaves, flowers and fruits.

Activity : 7.7

Visit a flower garden. Make a list of plants you notice there. List out the similarities and differences in them.



(a)Fungus (Agaricus) (b)Spirogyra (c)Liverwort (d)Fern plant

Fig 7.5 : Pictures of non-flowering plants

Non flowering plants include unicellular and multicelluar plants. Plants like algae, fungi, bryophytes and ptertridophytes are included in this group. Some plants have root system, stem, leaves but do not have flowers and fruits. Some are green and prepare their own food. Some are parasites and some are saprophytes.

Plants are grouped into three types based on the nature of their stem, root and height. They are herbs, shrubs and trees.

Plants such as ragi, paddy, radish etc. posses soft stem and roots and grow from a few inches to about 1-2 feet in height. These plants which belong to green grass variety are called herbs.

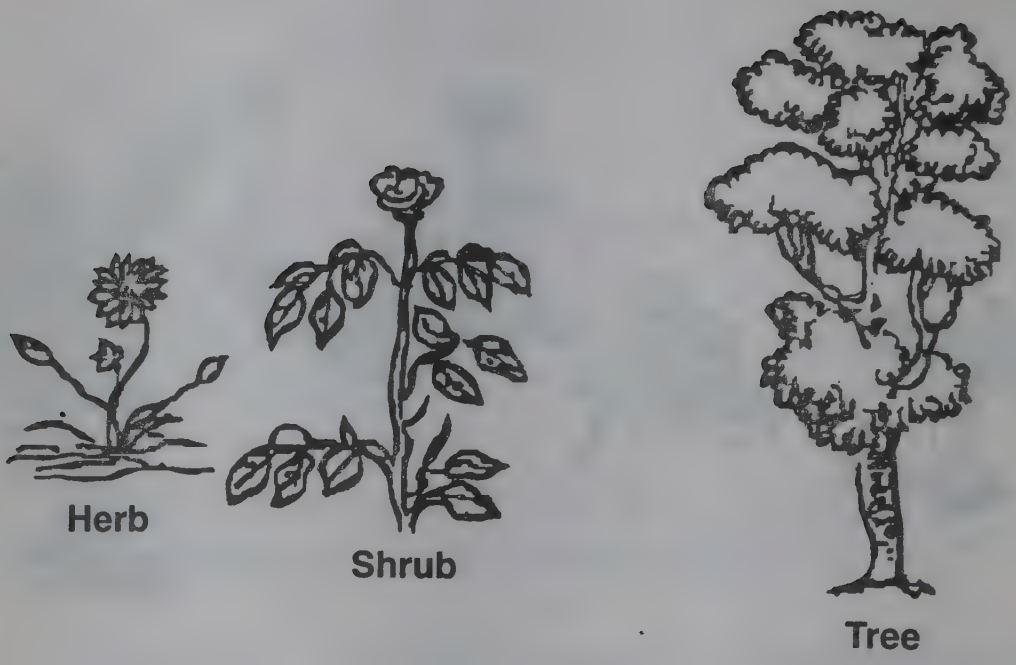


Fig 7.6 : Pictures of herbs shrubs & trees

Compare these herbs to the plants like mango, tamarind, banyan, coconut, eucalyptus etc. These plants have a hard or woody stem and roots, and they grow upto a height of 180 feet.

There are certain plants which are taller than herbs and shorter than trees. Such medium-sized plants are the shrubs.

ex: Hibiscus, Nerium, garden croton etc.

Activity : 7.8

Look at the herbs, shrubs and trees. List out the differences in them.

Herbs	Shrubs	Trees

On the basis of their life span, plants can be divided into three groups

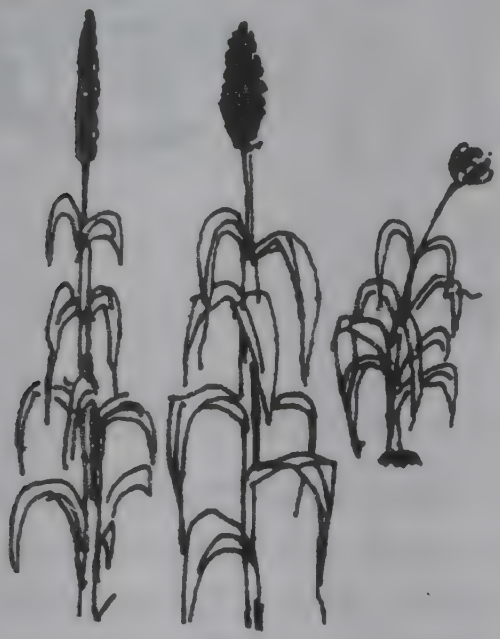


Fig 7.7 : Pictures of annual plants.

Sunflower, mustard, groundnut, paddy, ragi etc. after attaining full growth, produce flowers, fruits and seeds within a year. Afterwards they dry up. Such plants which live for one year are called annual plants.

Plants like cabbage, radish, carrot, beetroot etc. live for two years, such plants are known as biennials.

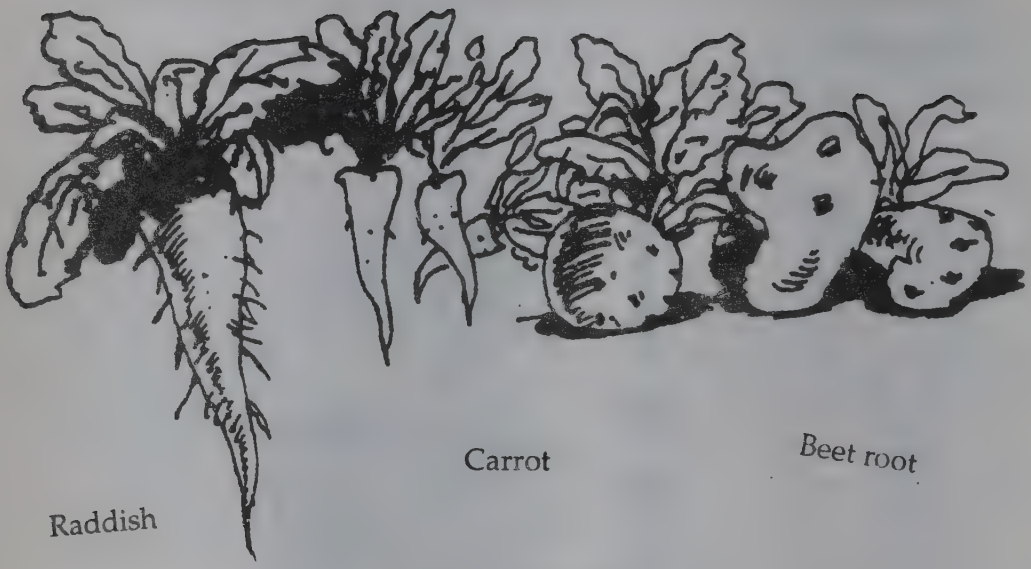


Fig 7.8 Pictures of biennial plants

Apart from annuals and biennials, there are some plants which live for many years. They are called perennials. ex: Coconut, banyan, eucalyptus, peepal tree etc.

Fig 7.9 Pictures of perennials

Activity : 7.9

Make a list of annuals, biennials and perennials you know

Sl. No.	Annuals	Biennials	Perennials
1.			
2.			
3.			
4.			
5.			
6.			

Some animals are unicellular and others are multicellular.

Some animals have back bone. They are called vertebrates. ex. frog, snake, bird, man.

Animal which do not have backbone are called Invertebrates, ex. insects, earthworm, snail, millipede.

Activity : 7.10

List out the Vertebrates or Invertebrates that you know

Vertebrates		Invertebrates	
1.		1.	
2.		2.	
3.		3.	
4.		4.	
5.		5.	
6.		6.	

Animals reproduce in different ways. In lower animals like amoeba or hydra, the body divides and each part develops into a new one. Few animals like birds, lizards, lay eggs. Higher animals like cat, cow, human beings, give birth to young ones.

Activity : 7.11

List out animals that lay eggs and those which give birth to young ones.

The body of animals is covered with different types of coverings to protect against cold and heat. For ex. Snakes and fish have scales. The skin of earthworm has slime. Porcupine has spines on the skin. Birds like hen, sparrow have feathers. Sheep, cat, dog, bear have hair on their body.

There are numerous plants and animals on the earth. We have studied their characteristics. This helps us to classify them. We have noticed that there is a close relationship between the characteristics and life style of the living beings.

Exercises 7

I. Four answers are given to each questions. Select the correct word and write.

1. It is a domesticated animal.....

   a) Ant b) Crow c) Cow d) monkey.

2. It is an amphibian.....

   a) fish b) frog c) parrot d) fowl.

3. It is a herbivorous animal.....

   a) Dog b) tiger c) man d) rabbit.

4. It is a carnivorous animal.....

   a) Crow b) bear c) Lion d) deer

4. It is an Omnivorous animal.....

a) Cat b) pig c) Lion d) tiger

6. It is a web-weaving insect.....

   a) Butterfly b) Mosquito c) termite d) spider.

7. This bird weaves its nest.....

   a) sparrow b) weaver bird c) hawk d) eagle.

8. It is a nocturnal animal.....

   a) Pigeon b) donkey c) cobra d) owl

9. The scientific name of man.....

   a) Felis Tigris b) Homo erectus c) Home sapiens d) Rana hexadactyla.

10. This animal moves away from light.

    a) Mosquito b) Bed-bug c) moth d) scorpion.

11. *a) Draw a neat diagram of a plant and label its parts.*

    b) Draw a neat diagram of a typical flower (Hibiscus) and label its parts.

III Give scientific reasons for the following:

1. *Amoeba cannot be seen by our naked eyes.*
2. *Leaves are green.*
3. *Frog is an amphibian.*

IV. Answer the following question:

1. *Mention the important characteristics of living beings.*
2. *What is a species?*
3. *What is meant by photosynthesis?*
4. *Give four examples for flowering and Non-flowering plants.*

Chapter - 8

STRUCTURES AND FUNCTIONS OF LIVING BEINGS

Animals and plants have different organs to perform different functions. Animals have eyes, ears, hands and legs. They are external organs. Heart, lungs, kidneys etc., are internal organs.

Each organ has a definite function. Eye is the organ of vision. Ears help in hearing sound. The structure of different organs differ.

The different organs of the body co-ordinate for the proper functioning of the body.

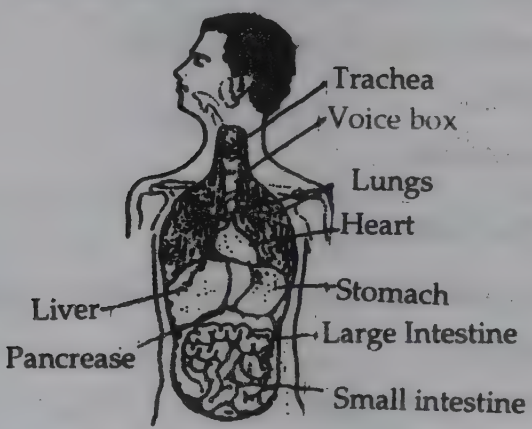


Fig 8.1 Internal organs of man

Activity : 8.1

List out the organs of our body and name their functions.

Plants also possess different organs to perform different

functions.

Activity : 8.2

Pull out the different plants and observe their root system. Compare the root system of a paddy plant with that of a bean plant. What differences do you notice?

The shoot system of the plant is aerial. It includes stem with its branches, leaves, flowers and fruits. The stem performs the following important functions.

1. It bears leaves, buds and flowers for reproduction.
2. The food prepared by leaves by the process of photosynthesis is transported to different parts of the plant through phloem. (food conducting tissue).
3. It also transports water and mineral salts absorbed by roots to the leaves through xylem (water conducting tissue).
4. It spreads out the leaves to sunlight and air.

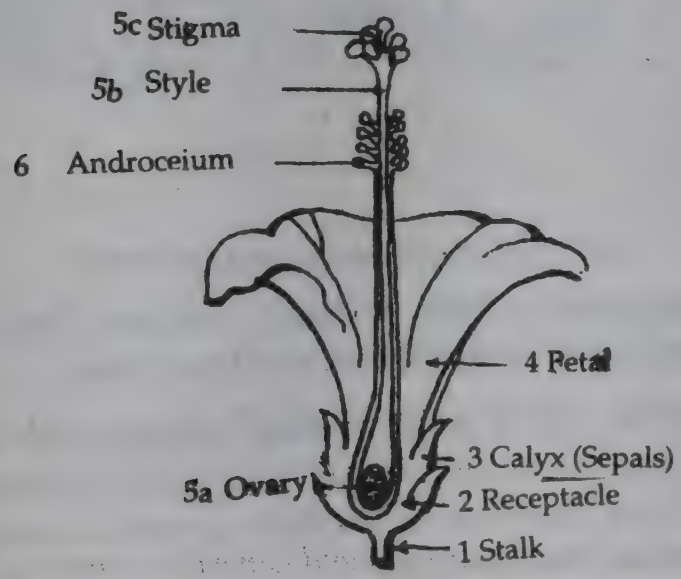


Fig 8.2 Parts of a typical flower

1. Stalk (Pedical) 2. Receptacle 3. Calyx (Sepals) 4. Petal (Cortex) 5. Gynoecium 5a. Ovary 5b. Style 5c. Stigma 6. Androecium

The flowers are the reproductive parts of the plant. Different parts of the flower are shown in the figure.

Activity : 8.3

1. *Visit a flower garden and collect different types of flowers. Compare their ovaries and stamens.*
2. *Collect the pictures of different flowers. Write their diagrams and name them.*

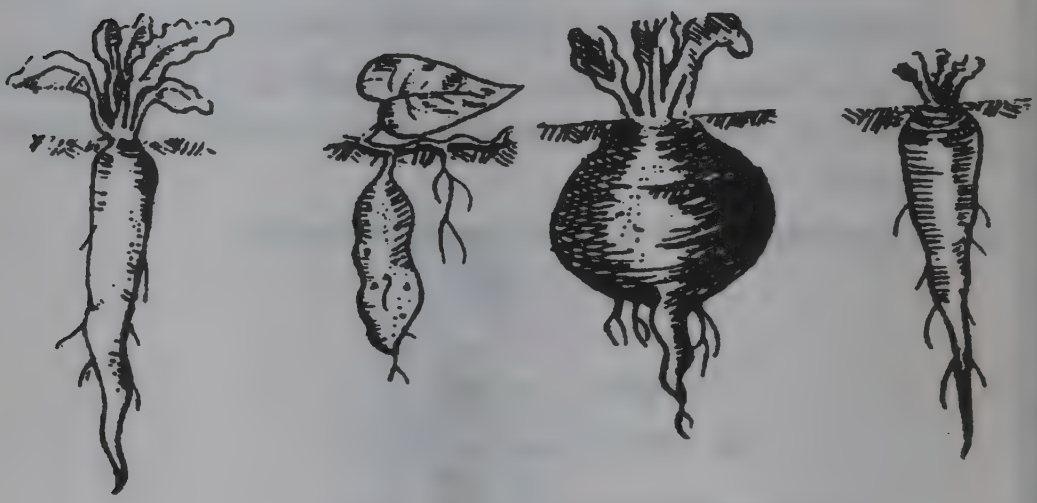


Fig 8.3 Radish, sweet potato, beet root, carrot

Notice the bulging roots in them. Compare them with the roots of other plants. What differences you notice?

The roots of radish, sweet potato, beetroot and carrot are swollen because of the storage of food in them. Such plants make use of the stored food for their growth whenever they need. We too use them as food.

Activity : 8.4

Draw the pictures of radish, sweet potato, beetroot and carrot. Colour them with suitable colours. Collect the roots of this type and draw their pictures.

Activity : 8.5

Observe plants like jowar and sugarcane. Draw the diagram of such roots.

Normally the shoot system is present above the ground. But in some plants such as ginger, potato, onion and amorphophallus, the stem is modified for the storage of food and vegetative reproduction.

Fig 8.4 Ginger, Potato, Onion

In certain plants like pumpkin, grapes and betel, the stem is weak.Such plants develop coiled, leafless, parts called tendrils. They help the plant to climb on a support. In a pea the terminal leaflets are modified into tendrils.

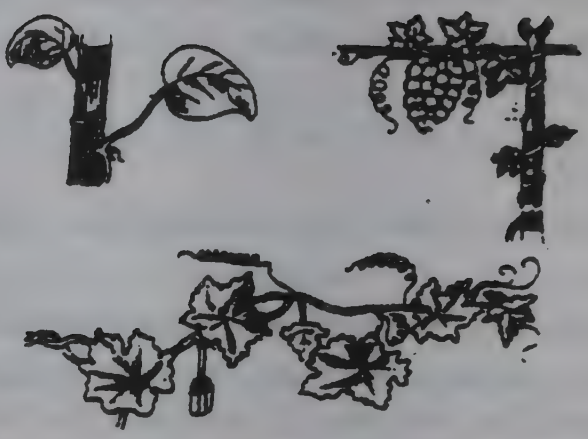


Fig 8.5 Tendrils of Pumpkin, Betel leaves & Grapes

Activity : 8.6

List out the other plants having tendrils.

Compare opuntia with some other plants. Are there any leaves in opuntia?

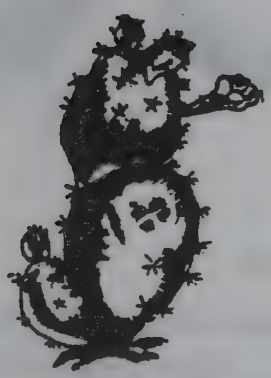


Fig. 8.6 Opuntia (cactus)

In Opuntia the stem is green, flattened and photosynthetic. The stem is fleshy and stores water for a longer time. Such a modified photosynthetic stem is known as phylloclade. It grows in temperate and dry areas. The leaves are modified into spines for protection and to reduce the rate of evaporation of water content.

Activity : 8.7

List out such modification in other plants.

Write their diagrams and name them.

Digestive system in Man

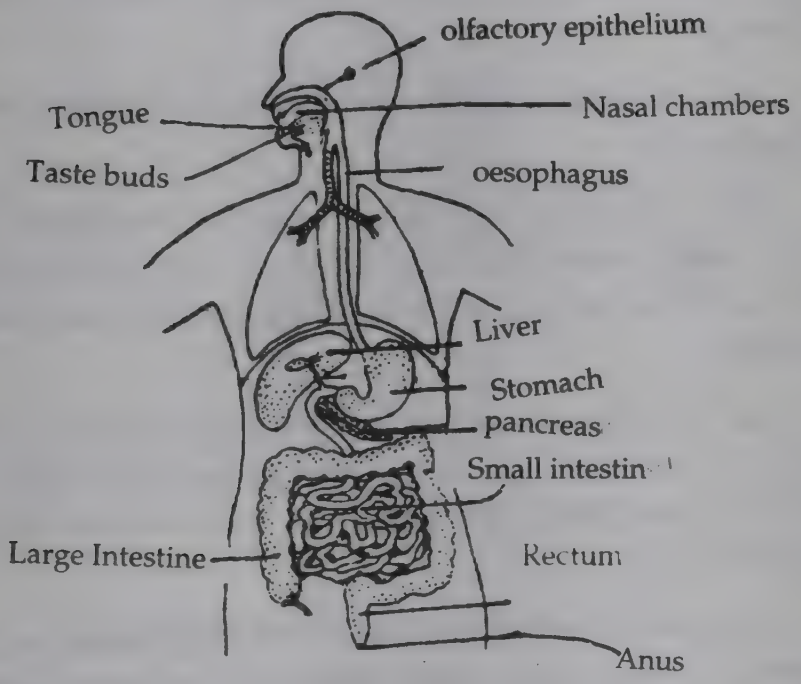


Fig 8.7 Digestive System

Food is very important for the growth of our body. The food that we eat is digested first and what the body needs are prepared by a variety of actions. Digestion may be defined as the process by which the insoluble complex foods are converted into simple and soluble foods making them absorbable into the blood.

The digestive system consists of the digestive tract and the associated glands.

The digestive tract or alimentary canal consists of the mouth, pharynx, oesophagus, stomach, small intestine, large intestine, rectum and anus. The associated glands are salivary

glands, liver,pancreas, (gastric glands and intestinal glands.)

The mouth has upper and lower jaws. There are teeth on the jaws. On the floor of the mouth is the tongue.

The food is chewed in the mouth. It is mixed with saliva. The food is made soft and pushed into pharynx with the help of tongue.

The food now enters the stomach through pharynx and oesophagus.

The stomach is bag like, located in the upper part of the abdomen. It stores the food for 3 to 4 hrs. Gastric juice secreted in the stomach digests food, is allowed to pass into the small intestine.

The small intestine is 5 metres long and coiled. The inside wall of intestine has finger like projections called villi. The food is completely digested. The villi helps in absorption of digested food.

The undigested food moves into large intestine. The water content is absorbed by the walls of the large intestine. Semi solid faeces are formed. It is stored in rectum and thrown out through the anus.

Activity : 8.8

Draw a neat diagram of the digestive system of man and label the parts.

Collect the pictures of the digestive system of frog, earthworm etc., and draw the diagrams and then compare them.

Respiratory system in Man

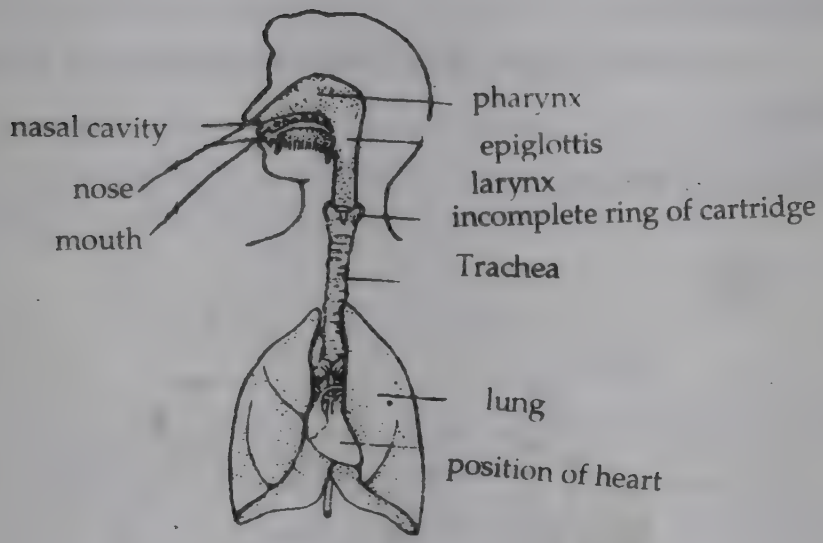


Fig 8.8 Respiratory system in Man.

The respiratory system consists of the nostrils, nasal cavities, internal nostrils, pharynx, larynx, trachea (wind pipe), brochi and bronchioles and lungs.

There are two stages in respiration or breathing.

1. Inspiration - during which air is taken to the lungs.
2. Expiration - during which air is expelled from the lungs.

Respiration is a process where oxygen is taken in and carbon-dioxide is given out.

The nasal passage has hairs and mucous producing cells. When air enters, the dust particles are trapped and air is filtered. The filtered air reaches the lungs.

There are two lungs located in the thoracic cavity. It is

surrounded by ribs. Each lung is made up of many air sacs or alveoli. The alveoli are surrounded by capillaries. The oxygen of the air diffuses into the blood capillaries. Carbon-dioxide from the blood gets into lungs.

Activity : 8.9

Draw a neat diagram of the respiratory system of man and label the parts.

The human heart

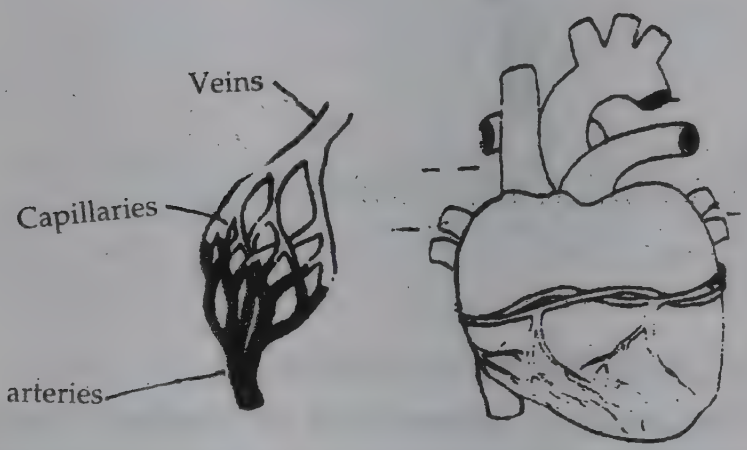


Fig 8.9 Human Heart

The heart is situated in the chest cavity. It is conical in shape and is about the size of one's fist. There are four chambers in the heart. The heart contracts to pump blood out and relaxes to resume used blood in. During the process sounds called heart beats are heard.

The oxygenated blood from the heart is carried in blood vessels to different parts of the body. The used blood is collected and brought to heart through blood vessels. There are three kinds of blood vessels.

1. Arteries
2. Veins
3. Capillaries

The right side of the heart receives used blood through superior and inferior venacava. Pulmonary arteries carry this blood to lungs for oxygenation.

The left side of the heart receives the oxygenated blood through pulmonary veins. This blood is distributed to all parts of the body through a large blood vessel called the aorta.

Activity : 8.10

Draw a neat diagram of human heart and label the parts. Apply blue colour to veins and red colour to arteries.

Collect the pictures of heart of different animals and stick to the cardboard. Write the names of respective animals.

Brain

The brain is located in the head. It is protected in the skull. The brain has three main parts. The cerebrum, the cerebellum and medulla oblongata. All these parts are involved to control the complex pattern of human behaviour. Sense organs receive stimuli from the surroundings. Nerve messages travel from receptors to the brain. Brain sends suitable responses to organs like muscles and glands. The messages are obeyed by all the organs of the human body. Thus nervous system is responsible for co-ordinating various parts of the body so that all functions take place systematically.

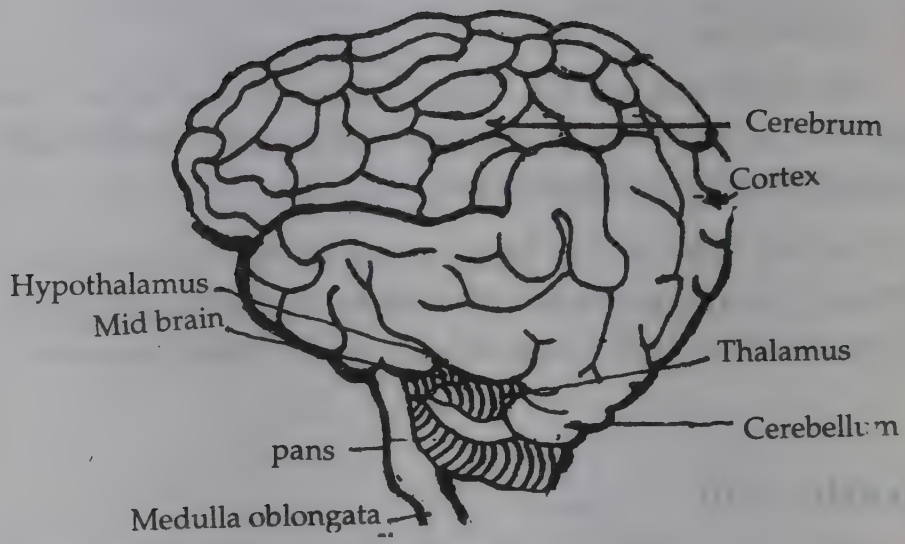


Fig 8.10 Human brain

Activity : 8.11

Draw a neat sketch of human brain and label the parts. Collect the pictures of brains of different animals and compare them.

Make a list of variation that you find.

Sense Organs

The organs which receive stimuli produced by the environment are our sense organs.

Eyes, ears, Nose, tongue and skin are our sense organs

The Eye

A pair of eyes are located in deep sockets or orbits in the front side of the head. The eyes perceive light and help the brain in recognising objects. The eye can be compared with a photographic camera.

The light reflected from the object enters the eyes. The

image is formed on the retina. The eye is connected with the brain by optic nerves. Through these nerves the brain recognises the objects.

The Ear

The human ear performs two functions, hearing and body balance. Sound waves are conducted through external ear into middle ear and inner ear. The inner ear is coiled like a snail: shell. Inside the cochlea sound perceiving takes place. The ear is connected to the brain by auditory nerves. The brain recognises the different sounds through these nerves.

The Nose

The wall of the nasal chamber is covered with epithelial layers of cells. When a smell or odour passes into the nose, the cells send impulses to the brain by sensory nerves. The brain recognise different smells.

The tongue

On the tongue taste buds are present. Taste buds are made up of taste sensory cells. These cells are stimulated by sweet, salt, sour, bitter substances. The sensory cells send impulses to the brain for recognising the taste.

The Skin

The skin is the outer most covering of the body. The skin has many functions. It protects the body. It serves as a sense organ for touch, pain, pressure, heat etc.

Activity : 8.12

Draw diagrams of sense organs and name them. Compare with the sense-organs of different animals.

Excretory System

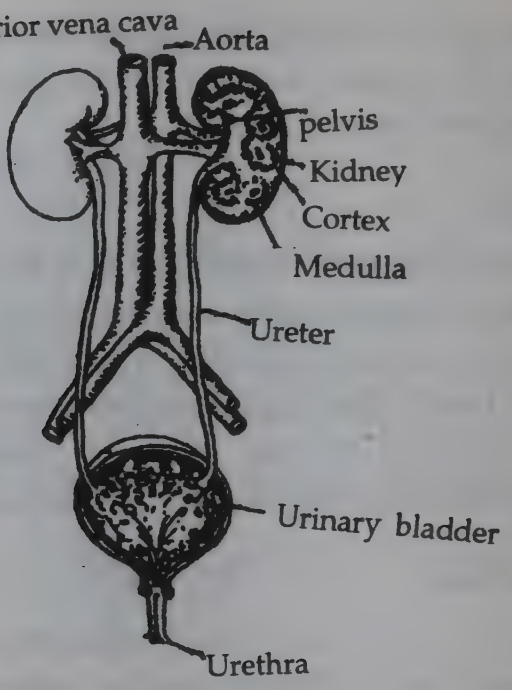


Fig 8.11 Kidneys & Urinary System

Kidneys are the organs of excretion. In humans there are a pair of reddish brown, bean like Kidneys. They are situated at the back of the abdominal cavity on either side of vertebral column. A tube called (2) ureter extends from each kidney to the (3) urinary bladder. Urine is stored in the urinary bladder and is later thrown out through the tube known as the (4) urethra. The kidney contains many tiny globules known as nephrons.These filter the waste material from the blood.

Activity : 8.13

Draw a neat diagram of kidney and label the parts.

Locomotion is one of the important characteristics of animals. They have locomotive organs for their movement.

Hands and legs are the locomotory organs in man.

The other animals such as fish and bird have locomotory organs like us.

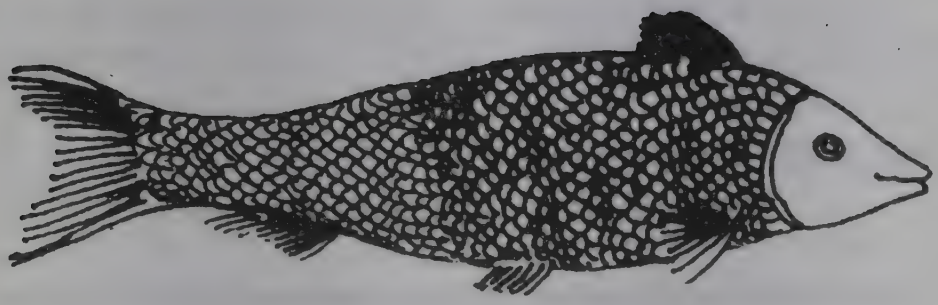


Fig 8.12 Fins of a fish

Fish is an aquatic animal. Fins help the fish to swim.

Fig 8.13 Wing of a bird

Birds use their legs when they are moving on land and use wings when they are flying.

Activity : 8.14

Make a list of various animals. Name the locomotory Organs of the animals

Reproduction is an inherent quality of all animals. Animals produce new individuals of their own kind. Reproduction also

takes place in human beings in the similar way.

Our body has definite organs to perform, respiration, digestion and circulation of blood etc. In the same way there are particular sex-organs to perform reproduction. Male and female organs take part in reproduction.

Exercises

I. Four answers are given to each question. Select the correct word and write:

1. *Eye, Ear, Nose, Tongue and Skin are.....*
   a) Excretory organs b) Respiratory organs
   c) Sense organs d) Digestive organs.
2. *The organ which prepares food in plant.....*
   a) Root b) Leaf c) Flower d) Stem
3. *The substance gives green colour to leaves.....*
   a) Salt b) Water c) chlorophyll d) Oxygen.
4. *Root system in monocot plant is.....*
   a) Tap root b) Fibrous root c) Sucking root
   d) prop root
5. *Reproductive organ of the flowering plants is.....*
   a) Stem b) Flower c) Root d) Leaf
6. *Male part of a flower is.....*
   a) Petals b) pistil c) Anther d) Ovary
7. *Root modified for storage of food is.....*
   a) Ginger b) Radish c) Onion d) Potato
8. *Spring like structure in pumpkin plant is.....*
   a) bud b) stem c) Leaf d) Tendril
9. *Gland which secretes saliva.....*
   a) Stomach b) Salivary glands c) Large intestine d) Pharynx.
10. *It is an excretory organ.....*
    a) Kidney b) Brain c) Stomach d) Tongue

II a) Draw the diagram of respiratory system and label the parts.

b) Draw the diagram of digestive system of man and label the parts.

III. Name of the organs are given under list 'A' and their functions under list 'B'. Write them in an order:

	A	B
1.	Mouth	a) Respiration
2.	Heart	b) Locomotion
3.	Lungs	c) Chewing of food
4.	Kidneys	d) Blood circulation
5.	Limbs	e) Excretion

IV. Give reasons for the following:

1. *Fish taken out of water dies.*
2. *Tongue detects the taste of food.*
3. *Animals need food for living.*

V. Answer the following questions:

1. *What is meant by respiration?*
2. *What is the function of kidney?*
3. *Mention the functions of root?*
4. *What is prop root? Give example.*
5. *Which are the important blood vessels of our body?*

Chapter - 9

AIR

Air surrounds the earth and is contained in a zone known as atmosphere. Without air there will be no rains, no crops, no vegetation and no life on the earth. The atmosphere acts like a

filter and prevents the harmful rays of the sun from reaching us. Air is necessary for sound propagation.

Air is a mixture of gases. It has no colour and no odour. It is not visible but we can feel the breeze. Since air is matter it occupies space, and has weight.

Activity : 9.1

Take a common balance. Place two balloons, having the same weight, one in each of the pans of the common balance. See that the pans are balanced. Take one of the balloons and blow air into it and tie its neck with a piece of thread. Place the balloon again on the pan of the balance. What do you observe?

Pan having the inflated balloon comes down. The other pan with deflated balloon goes up. The inflated balloon comes down due to the weight of the air it contains. Hence Air has weight.

Air is necessary for burning

Activity : 9.2

Fig 9.1

Take two candles and light them. Cover one of them with a glass tumbler. Let the other be burning as it is. Now watch and report what happens.

The burning candle covered by the tumbler puts out after a

short while. The other candle continues to burn. The candle covered by the tumbler could not burn further due to lack of air. This shows that air is absolutely necessary for the burning of a candle.

The burning of a substance or matter is called "combustion". When combustion of a carbon containing substances takes place, a gas called carbon dioxide is released. Respiration by living beings is also a type of combustion. During respiration oxygen is consumed and carbon dioxide is released.

Constant breathing by living beings and combustion of substances increase the carbon-dioxide content of the air continuously. But this does not happen. Green plants utilise carbon-dioxide for the preparation of their food and release oxygen. Thus a balance is maintained in the nature. Plants provide food to eat and oxygen to breathe.

You play foot-ball. The foot-ball has air inside. What do you do when your cycle tube gets punctured and why do you do so? You have seen the clouds moving. What is it that keeps the clouds moving?

The movement of clouds is due to air. The flying of birds and the movement of aeroplanes is not possible in the absense of air.

Activity : 9.3

You must have seen the farmer winnowing grains and cleaning the grains and cereals at home. How is air useful? Discuss.

Activity : 9.4

List the occasions in which you utilise air for daily activities.

Activity : 9.5

Look at the chimney in your house. Find out, why is it built like

a hollow pillar Discuss.

Look at the chimneys in factories around your town. Observe what happens to smoke that comes out of the chimneys.

Exercises

1. *How do you show that an empty vessel contains air?*
2. *How do you show that air contains water vapour?*
3. *What gases are present in air?*
4. *List out the uses of air?*

II Fill up the blanks with suitable words:

1. *The gas that supports burning (combustion) of substances in air is called.....*
2. *Plants use..... present in air to prepare their food..*
3. *..... protects us from the harmful sun's rays.*
4. *The gas that is liberated during combustion of carbon is.....*

Chapter - 10

WATER

There are many substances on the earth. Among them, the most common is water. Three-fourths of the earth's surface is covered by water. This is termed as hydrosphere. There is plenty of water in the form of water vapour in the atmosphere. In polar regions water is in the form of ice. There is also sufficient quantity of underground water. We get it when we dig a well.

Water is necessary for life

We use water daily for drinking, bathing, washing clothes and vessels and for cooking. All living beings depend on water. There is water vapour in the air too, without which

there would be no rains. Without rains the earth would become barren like the moon.

The food that we eat has plenty of water content. In pumpkin water content is 95%. Potatoes and meat 75%, eggs 73%. Our body is made up of about 70% of water. Food grains like rice and dal too have water even though they seem to be dry.

Plants dry up when they have no water source. So water is necessary for the survival of plants.

Water is necessary for industry and agriculture. Water is required for many activities of life. Where do we find Water?

Natural sources of water:

Natural sources of water are tanks, ponds, wells, rivers, lakes, seas and oceans.

Activity : 10.1

List out the different sources of water in your environment.

Water dissolves many things easily. So natural water is not pure. Water from wells will either be sweetish or saltish. Sea water is always saltish. Some sources of water get dried up during summer. Some tanks, ponds, lakes and a few rivulets become dry. What is the reason?

Activity : 10.2

In Our houses we spread the wet clothes on hanger. Why is this done? What happened to the water in the clothes?

When wet clothes are spread out the water content in the clothes gradually evaporates in the form of water vapour.

The water vapour escapes into the atmosphere. Similarly water from ponds, tanks, lakes, rivers also vapourises and

escapes into the atmosphere. The water vapour forms clouds in the sky.

In the early morning during winter you must have seen mist appearing like clouds on earth. Mist is formed when water vapour in air near the surface of the earth is cooled to small drops of water. Drops of water collect on leaves. This is 'dew'. Water vapour that rises higher form clouds. Clouds consist of tiny water drops. The water drops combine and become larger and fall as rain. If water drops from the clouds are highly cooled they are converted to tiny flakes of snow.

Rain water is the relatively pure form of water in nature. Rain water in turn reaches ponds, lakes, wells and rivers. River water reaches the seas and oceans. In nature, water changes into water vapour. The water vapour changes into clouds. Clouds bring rains. These changes are called "Water cycle". Water cycle repeats itself regularly.

Water Cycle

Fig 10.1

We use well water or river water or tap water for our daily needs. In tanks and lakes, people wash clothes and wash

domestic animals like cows and buffaloes. In this way, lake or tank water gets polluted. Polluted water, contains many impurities. Such water is dirty and not fit for drinking.

Properties of Water

Water is colourless, odourless and tasteless liquid. When water is heated, it changes into water vapour. When water vapour is cooled, it changes back into water.

When water is cooled it becomes solid ice. When we heat ice, it melts to become water. Thus water can take the form of solid, liquid or gaseous (vapour) state .

Water freezes at 0° C.

Activity : 10.3

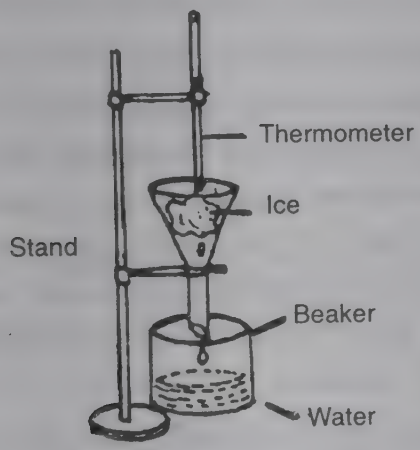


Fig 10.2

Arrange the apparatus as shown in the fig 10.2 Dip the thermometer in the ice pieces in the beaker. The mercury level in the thermometer gradually goes down and stands at 0°C. Allow some more time and watch. There is no further fall in the level of mercury. What do you understand by this?

This shows that water when cooled becomes ice, and the temperature of ice is 0°C. This temperature is called freezing

point of water.

Boiling point of water

Activity : 10.4

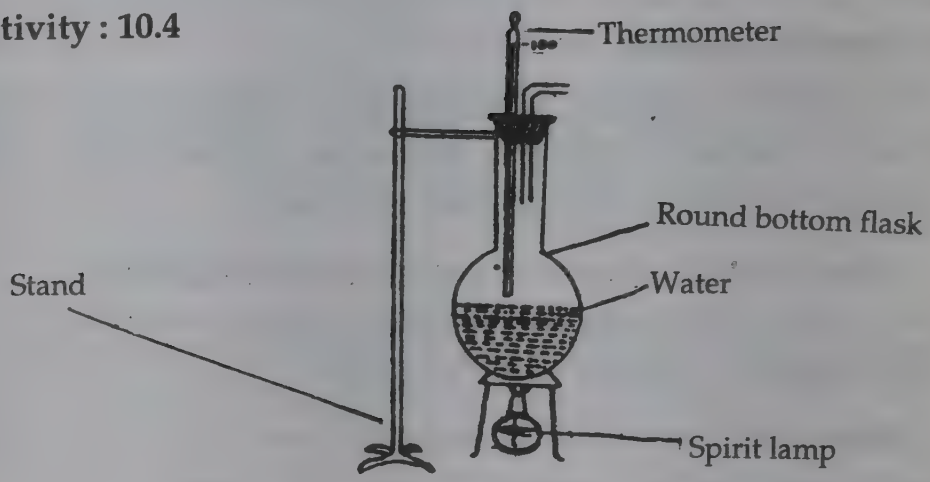


Fig 10.3 Finding the boiling point of water.

Take a round bottom flask. Fill it with water upto half its volume. Clamp it to a stand. Introduce a thermometer, such that its bulb is just above the water level. Heat the water. Water boils and becomes steam. Now observe the mercury level in the thermometer. It gradually rises and stands at a particular level. Allow water to boil for some more time. Now, observe the mercury level. What do you understand by this? This is the boiling point of water.

The boiling point of water is not the same at all places. At sea level, the boiling point of water is 100°C.

Hard Water:-

In some places, water does not give lather easily with soap. Such water is called hard water. Hard water contains dissolved impurities such as bicarbonates sulphates and chlorides of calcium and magnesium. Plenty of soap is wasted using such water for washing. More over this water is saltish to drink.

Water which gives lather easily with soap is called soft water.

Hard water can be changed into soft water by boiling or by adding calculated amount of lime water or washing soda.

Water Pollution

River water or tank water contains soluble substances and harmful impurities due to human activities. The wastes of industries and the sewage of towns and cities make the water dirty. Such water is said to be polluted. Pollution causes several diseases. This also endangers the lives of animals that live in water.

Our government has undertaken several steps to control and prevent water pollution. We have to co-operate with the government. We must not allow the pollution of natural sources of water such as ponds, rivers, lakes and tanks. Water is an important natural resource. It is our duty to prevent water pollution. We also should not waste water, which is highly useful to all of us.

Exercises

1. *Which are the natural sources of water?*
2. *State the important properties of water.*
3. *Well water is more safe for drinking than lake or tank water, why?*
4. *Which type of water is not good for washing clothes, why?*
5. *What is water cycle? Explain.*
6. *What is water pollution? What are its effects?*
7. *List out the uses of water.*
8. *How do you find the boiling point of water?*
9. *How do you show that dry rice and dal have some water in them.*
10. *What is under ground water?*

Chapter - 11

ENERGY

What is energy?

You feel tired if you work continuously for a long time. When you are tired you will have less capacity to do work. Therefore, the capacity required to do work is known as energy. This goes on decreasing as we go on doing work. Why? When we do work, our energy will be utilised or spent in doing the work. Therefore, there is a close relationship between work and energy.

What is work?

In every day life you will be doing different types of work like reading, writing, playing etc. When you are engaged in any kind of work, then you say "I am doing work". But in science there is a separate meaning for work. When an object is moved from one place to another by applying a force on it, then we say that work is done. If you are pulling a bucket of water from a well, then you are doing work because the bucket is made to move upward by our force. Similarly, if you kick a football, it moves forward to some distance, then also you have done work.

Different forms of Energy

Mechanical energy

Work is said to be done if we raise an object from the ground. The higher we raise the object from the ground more is the work done. We do this work by utilising our energy.

When an object falls from a height the mechanical energy stored in it gets released and does the work.

Activity : 11.1

Give examples of objects having mechanical energy due to its position.

A boy is throwing a stone using a catapult. When the fingers that pulls the rubber string is released the stone is thrown up to a distance. Here also the energy in the pulled up rubber string is mechanical energy.

An object is thrown up by a pressed spring. The energy stored in the pressed spring is mechanical energy. The energy utilised to press the spring is stored in the spring in the form of mechanical energy and it has the capacity to do work.

The needles of a clock move by the mechanical energy of its wound spring. In general, we can conclude that the energy stored in an object due to its position is known as mechanical energy. When this mechanical energy gets released then the same amount of work will be done. This implies that work also can be stored in an object in the form of mechanical energy and when this energy is released then the work will be done.

In a moving object energy will be stored due to its movement. As the velocity of the moving object increases, the energy that gets stores in it is also increased. Due to this stored energy work will be done. If the stored energy is more, the work done by it will be more. The energy possessed by an object due to its movement is called **mechanical** energy.

All moving objects, like moving car, moving ball, moving wind and flowing water etc. will have mechanical energy in them. The amount of mechanical energy possessed by a moving object depends upon the velocity of that object.

We can conclude that there are two types of mechanical energy. First, mechanical energy due to position and secondly mechanical energy due to movement.

Chemical Energy

Take a match stick. Rub the head of the stick against the side of the match box. What do you see? The match stick burns and gives light and heat. Rub the other end of the match stick against the side of the match box. What do you see? It does not burn. Why? You find some blackish chemical substance. When the chemical substance takes part in the process of chemical change, the energy hidden in the chemical substance is known as chemical energy.

Heat Energy

Activity : 11.2

Take a hard glass test tube. Fill three fourths of it with water. Put a cork tightly on the mouth of the test tube.Heat the bottom of the test tube. Water begins to boil. After a few seconds the cork flies off with a big sound. Why? How did the cork get energy to fly off? The heat has provided the energy to the cork for this movement.

Electrical energy

When you put on the switch of an electric fan, an electric current begins to flow in to the fan and the fan begins to rotate. Here the fan moves due to the electric current. Therefore, electricity is a form of energy. In your daily life you might have seen the rotation of wheel of water of pump by using electricity. In flour mills you find the rotation of a machine by using electricity.

Activity : 11.3

Make a list of examples in daily life where work is done by using electrical energy.

Transformation of energy

One form of energy can be transformed into another form.

Electric bulb burns by the electric energy and gives light. Here electric energy is transformed into light energy. Machines rotate by the electric energy. Here electric energy is transformed into mechanical energy.

Activity : 11.4

Give some more examples in daily life wherein one form of energy is transformed into another form of energy.

Sources of Energy

You know that all animals like human beings get energy from food. Plants are the main source of energy for all animals. Plants use solar energy to prepare their food. Food is stored in plants. Therefore, food is a source of energy. Firewood, kerosene oil, LPG are used to cook our food. When they are burnt they give out heat energy. These substances are called fuels.

Solar Energy

We get heat and light energy from the sun. Energy is being liberated from the sun naturally and continuously forever in nature. Plant prepare food by using this solar energy. So, the sun is the main source of energy. Scientists all over the world are conducting researches to make use of this natural and abundant energy of the sun for different uses in daily life. Now we are able to use this solar energy in cookers, water boilers, electric cells etc. Motors are run by using solar energy. Our space ships like Insat IA, IB & IC etc., work by using solar energy.

Wind as a source of energy

Blowing wind provides energy without any expense.

Activity : 11.5

Prepare a winged wheel using paper. Run by holding it against blowing wind what happens? The wheel rotates.

Different types of wind propelled machines are built on the same principle to grind grains, to lift water from wells and for many more types of work. Electricity is obtained by using the energy of the wind. Wind energy cannot get exhausted by its extensive use, because wind will be blowing forever in nature. Therefore, like solar energy, wind energy is a non-exhaustible source of energy. You know that air gets polluted by the use of coal and petroleum . But air will not get polluted by the use of wind energy. Researches are going on to make use of wind energy for many more types of work in daily life.

Energy from water

Flowing water is a source of energy.

The flowing water of the rivers can carry big wooden logs from one place to another.

As you pour water from a height on the winged wheel, the wheel begins to rotate. You will also find that as we increase the height from where water falls, the speed for rotating wheel increases. This shows clearly that flowing water is a source of energy. Electricity is generated on a large scale by using the same principle. Big dams are constructed against the flow of the water of the river and water is stored in a reservoir. This stored water is taken to turbines kept in a low lying area through pipes and thereby electricity is produced by the fast rotation of the turbines. The stations producing electricity on a large scale by the use of water energy are known as hydroelectric power stations.

Activity : 11.6

Name the different hydroelectric power stations in Karnataka and locate these places on the map. collect the pictures of these stations. Visit a generating station and know how the electricity is produced.

Water is a natural source of energy Just like solar energy, water energy is non-exhaustible and available forever. This water energy can be used again and again. The use of water energy will not pollute the environment.

Energy from Bio-mass

Wooden pieces, dry leaves, cow dung and excrete of animals are the products of living beings. These are known as "Bio-masses". These biomasses can be used in two ways to get energy. First of all the wood, leaves, cow dungs etc. are dried. The dried ones are burnt directly to get heat. You find that many types of work like cooking, heating water, getting steam etc. in our houses are done by using these dried biomass. This is one method of getting energy for work by using biomass.

These biomasses can be decayed and thereby gas can be collected. The gas collected by the decay of wet biomasses is called "bio-gas". This bio-gas is burnt as a fuel to get heat and light. You find that in villages 'Gobar gas' is prepared by using cow dung and used as a fuel to cook food.

If we leave the biomass as it is in the environment, they decay decompose and thereby the environment gets polluted. The use of biomass helps in two ways. Firstly, it prevents pollution of the environment by the decay of the biomass. Secondly it provides energy for use. The expenditure to get this biomass is very low. so, by the use of biomass we get a good fuel with minimum expenditure.

Water, air and sun are everlasting and are non-exhaustible

sources of energy as these sources can be used again and again. They are available in nature in plenty. The air will not get polluted by the use of these resources. So they are the best sources of energy. Efforts are being made to make the best use of these sources to get maximum energy. This is the only way to meet the increasing demands for energy by the rapid growth of population.

Activity : 11.7

Study the method of preparation and use of Gobar gas in villages. Collect the pictures.

Exercises

I. Four answer are given to each question. Recognise the most appropriate answer.

1. *What do you call the capacity to do work?*
   a) Force b) Energy c) Movement d) Velocity
2. *Which of these possesses maximum mechanical energy?*
   a) Stone kept on the ground
   b) Stone on top of a hill
   c) Stone raised to a height
   d) Stone at the bottom of a deep well
3. *The energy possessed by a moving object is*
   a) Chemical Energy b) Food energy
   c) Electrical energy d) Mechanical energy
4. *Which energy is used to get photo?*
   a) Light energy b) Heat energy
   c) Mechanical energy d) Chemical energy
5. *Energy stored in a pressed spring is*
   a) Electrical energy b) Solar energy
   c) Chemical energy d) Mechanical energy
6. *This source of energy cannot be used again and again*
   a) Petroleum b) Flowing water

c) Blowing wind d) Sun

7. *To which form of energy, electrical energy is transformed in an electric fan?*

   a) Light energy b) Chemical energy
   c) Mechanical energy d) Wind energy

II. Every item in group B matches more correctly with only one item in group A match them.

	A	B
1.	Water	1. Preparation of food by plants.
2.	Sun	2. Gobar gas
3.	Crackers	3. Petroleum
4.	Diesel	4. Hydro electric power stations
5.	Biomass	5. chemical energy

3. *Make a list of types of work that can be done by using electric energy.*
4. *Name different forms of fuels.*
5. *What are the non exhaustible sources of energy? Why?*
6. *Name two methods of getting energy from biomass.*
7. *How will you show that moving objects posses mechanical energy?*
8. *Which is the main source of energy for living plants and animals? Why?*

Chapter - 12

BALANCE IN NATURE

You know that, around us there are non-living things like air, water, soil, stones etc. and living things like animals, birds, germs, insects, plants and trees. All these living and non-living things around us together, constitute our environment. We are indivisible parts of our environment. Our environment influences our life.

Do you know how animals depend on plants, how plants

depend on animals and how we the human beings, depend on living and non-living things in our environment?

Inter-dependence of Living Beings

Human beings depend on Animals. We depend on animals for milk, eggs, meat etc. Therefore man depends upon animals for food.

Activity : 12.1

Make a list of the food products got by us from the animals. Name the animals.

We use animals like horse, donkey etc. to travel from one place to another. We also use them to transport goods to different places. We use oxen to plough our fields.

Activity : 12.1

Make a list of the food products got by us from the animals. Name the animals.

We use animals like horse, donkey etc., to travel from one place to another. We also use them to transport goods to different places. We use oxen to plough our fields.

Activity : 12.2

Make a list of all the animals used by us for transport.

Make a list of all the animals used by man for the transport of goods.

Make a list of all the animals used in agriculture.

The wool for our winter clothing is got from animals. The leather for our bags that we use in daily life are obtained from animals.

Activity : 12.3

Make a list of the animal products we use. We can find that man

depends on animals for his many needs.

Man depends on plants

The food that we eat like rice, wheat etc. are produced by plants. You also know that the wooden materials that we use to construct our houses are got from plants. They are teak, rose wood, red cedar, honne, matti etc.

The plants like tulsi, lemon, ginger etc., are used in medicines.

Activity : 12.4

Make a list of plants that are used as medicines in our daily life.

We can find that man depends on plants to meet his basic needs like food, shelter, medicine etc.

It is understood that man is the most evolved species among all the living beings. But it is clear that he is dependent upon other plants and animals for all his needs.

Animals depend on plants

Like human beings, animals need food. Some animals eat only plants for their food. Such animals are called herbivorous animals. Herbivorous animals eat plant products like grass, leaves, fruits, grains etc.

You know that monkey, cattle, goat, sheep etc. are herbivores.

Activity : 12.5

Make a list of other herbivorous animals you see in your day to day life and collect their pictures.

Birds build nests on trees, snakes live in burrows, insects live on plants, monkeys live on trees.

From these, we can understand that some animals depend

on plants for their shelter.

Activity : 12.6

Make a list of animals that depend on plants for their shelter in your environment. Collect their pictures and specimen of nests.

You know that animals like lion, tiger, leopard eat other animals like cattle, goat, sheep etc. These eat only flesh and are called carnivorous animals. You know that cattle, goat, sheep and deer are herbivores. What does a frog eat? Frog eats insects. Insects eat leaves, flowers and fruits of plants. Frog is a carnivorous animal. All carnivorous animals depend on herbivores for their food.

Activity : 12.7

Make a list of carnivorous animals in your environment and collect their pictures.

Plants prepare food by using water, minerals, carbon di oxide, in the presence of sunlight. You know that carbon dioxide is released into the air by the respiration of animals. Thus plants depend on animals for preparation of their food.

Butterflies make pollination possible by flying from one flower to another. Seeds of some plants are dispersed to distant places by sticking to bodies of animals. Animals and birds help in the dispersal of seeds.

Waste of the animals, dead and the decaying bodies of animals serve as a good manure to plants. Plants absorb minerals and nitrogenous materials from this manure with the help of their roots, and grow. Therefore, plants depend on animals for their growth. So we can say that animals depend on plants for their many needs and so also plants depend on animals.

Animals depend on non-living things in the environment

All animals including man use air from the environment. Man used soil to grow his food. He gets water from ponds, wells, river, and lakes. So do the other animals. Some animals live on land for example - elephant, tiger etc. Animals like fish and whale live in water. Man used land, rocks, soil to construct his house. He prepares different implements by using metals from the earth. All animals get heat and light from the sun. Thus, all animals depend on non-living things like air, water, soil, rocks, sun for their respiration, shelter, food and energy.

Plants depend on non-living things in the environment

You know that plants depend on non-living things like air and sun for their food preparation. They get water and mineral from the soil. Plants use air from the environment for their respiration. Therefore, plants depend on non-living things like air, sun, water soil etc. for their life and growth.

Food Chain

All living beings need energy and other things to live and grow. They get energy for their different activities from the food. Do you know which is the main source of energy for all living being on earth? Sun is the main source of energy for all living beings. How do plants get energy from the sun? Almost all the leaves are green, because there is a green pigment called 'chlorophyll' in the leaves. This has the capacity to absorb sun's energy. Plants prepare food using this energy absorbed by chlorophyll. Therefore solar energy is stored in the food.

There are nitrifying bacteria in the soil. They release nitrogenous compounds into the soil by using solar energy. Plants absorb these nitrogenous materials with the help of roots and store them in the form of proteins. Animals get this energy when they eat plants. Animals live, grow and stay

healthy with the help of this energy.

You know that carnivorous animals eat herbivorous animals for their food. So carnivorous animals get their energy from herbivours animals.

In the food chain the energy is transferred from one living thing to another in the form of food. This is known as transmission of energy.

Role of putrefying bacteria in food chains

Do you know what happens to the dead bodies of animals buried in soil? The body of the dead animals decays. Bacteria in the soil decompose the dead body and releases nitrogen into the air, while the remaining things are mixed in the soil. Such bacterias are called as putrefying bacteria. All dead bodies are decomposed after a few days and are mixed in to the soil. Such a soil is a very good manure to plants. In the same manner, dead plants, leaves, grains, urine, excreta of animals mix in the soil by the action of bacteria. The process of decomposing complex parts of animals and plants into simple components and mixing in the soil is known as putrification.

What would happen if there were no putrefying bacteria in the soil?

Activity : 12.8

Cover the leaves and decaying materials in the soil. Observe them after a few days.

Balance In Nature

You have understood that living beings depend on other living organisms and all living organisms depend on non-living things in nature.

Observe a field where food crops are grown. We can observe small germs and insects living on plants. You can see frogs hopping,insects and grass hoppers flying over the crop. Why is this happening?

Frogs and insects live by eating smaller germs and insects. What will happen if we destroy all frogs? In the absense of frogs there will be an increased population of germs and insects. This results in the destruction of crops. There would be a scarcity of food for herbivorous animals. Changes in the number of one type of organisms lead to the imbalance of relation between the groups of organisms. Let us take another example. Lions and tigers in the forest eat other animals like deer, bear etc., to live. What will happen if all tigers are destroyed? The number of wild bears will increase beyond control and crops will be destroyed. This affects the life of other herbivores.

Activity : 12.9

List the effect of destruction of different organism in the food chain that exists in nature.

All organisms are interdependent in the food chain of nature. Nature controls the size of population of each type of organism. Their number does not exceed beyond a limit. This maintains the natural balance. In this balanced state, destruction of any one group of organism lead to the destruction of other organism groups and the natural balance among living beings will be upset.

Destruction of natural balance by man

Man is continuously destroying the forest area for fuel, housing materials and land for cultivation. As a result, forest animals like tiger, lion, leopard, etc. are becoming extinct due to lack of shelter. Cutting of forest trees reduce the seepage of

water into the soil resulting in the reduced underground water. Deforestation causes loosening of soil. Flowing water washes away the fertile soil. As a result barren land and deserts are increasing. Lack of fertile soil and water scarcity decreases the food production causing famine. Due to this, human beings and animals die of hunger. Therefore destruction of plants and trees in the forest results in the destruction of other living organisms and creates ecological imbalance in nature. Who is responsible for such an imbalance? Man is upsetting the natural balance for his own selfish interest.

Man and Environmental Pollution

You have understood that in nature, living and non-living things depend on each other. You know that every living organism needs fresh air, and soil. But do you know that we human beings are polluting these very essential things for our own selfish reasons?

As the population increases we require more basic requirements. In order to meet these, we set up more number of factories. Through these factories we are adding more and more poisonous materials and polluting the environment.

You observe that factories in cities release many unwanted materials and polluted water into the river. When such polluted water get mixed with the river and sea water they also become polluted. Polluted water destroys aquatic plants and animals. When we use such polluted water, our health will be affected. Similarly other living organisms also suffer.

Thus, man is polluting his environment and thereby spoiling his own life and that of other living beings. Hence it is necessary to maintain a balance in nature.

1. Plant trees in vacant land area and look after them with

proper care.

2. Leaves and branches of plants should not be cut. Cutting trees should be avoided.
3. Maintain cleanliness around your home.
4. Protect the animals and birds around you.
5. Don't throw waste materials indiscriminately.

Exercises

1. *What is meant by environment?*
2. *How do animals depend on plants?*
3. *How do plants depend on animals?*
4. *What is meant by food chain?*
5. *What steps are necessary for us to maintain a balance in nature?*

Chapter - 13

THE UNIVERSE

13.1 Introduction

We are living on the earth. We see the bright sun in the sky during daytime. On many nights we see the beautifully shining moon. Besides the moon, many shining and twinkling objects are also seen in the sky. These twinkling objects are called "Stars". They are self luminous objects. They are very bright. They are at a great distance from us. Therefore, they look small and dim. The sun is an ordinary star close to the earth and looks very bright.

The other bright objects in the sky are planets. They are not self-luminous objects. They look bright because they reflect the sun's light that falls on them.

You must have observed some objects falling from the sky.

People say "a star is falling". They are not stars at all. They are meteors. You also see other heavenly bodies such as planets, comets, asteroids and satellites.

Stars are very far from the earth. The distances cannot be measured in kilometers. There is a separate unit of measurement for these great distances. It is called a "light year'. Light travels at the rate of 3,00,000 km per second. The distance travelled by light in one year is called a light year.

Stars are several light years away from the earth. The distance between one star and another is also several light years. All the objects in space like the sun appear to move from east to west. But this is not true. You have travelled in a train. When we are moving in a train, the plants and trees appear to move fast in the opposite direction. Actually, it is the train that is moving. Similarly, the stars appear to move as the earth is turning on its own axis. The sunrise and the sunset appears due to rotation of the earth. As the earth is rotating from west to east, the other bodies in space appear to move from east to west.

13.2 THE SUN

The sun is an ordinary star among the objects in space. It is the nearest star to the earth. Its diameter is 3.14×10^6 km. About 190 times the earth's diameter. It is rotating round on its own axis slowly.

The sun appears to us as a huge ball of fire. It is a store house of energy. Do you know the temperature of the outer surface of sun? The boiling point of water is $100^{\circ}C$. The temperature of the outer surface on the sun is nearly 60 times the boiling point of water. That means it is nearly about $6000^{\circ}C$. Can you imagine the inner temperature of sun? It is around 10 lakh degree Celsius.

The sun's energy is constantly spreading in all directions. A small portion of this vast energy reaches the earth in the form of heat and light. It is the sun's light that helps the growth and development of plant and animal life. The sun is the source of all energy.

13.3 THE SOLAR SYSTEM

Planets, asteroids, meteors, meteorites and comets and other objects in space which are going round the sun from the "solar system".

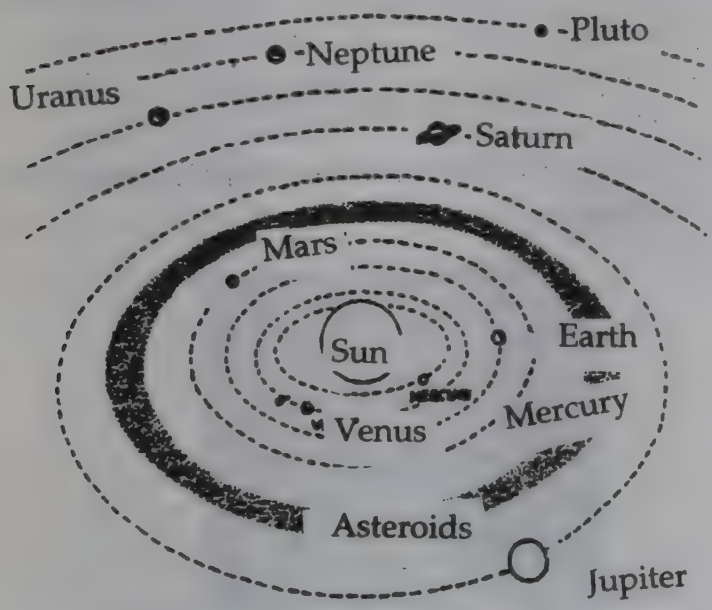


Fig 13.1 Solar system

Planets move round the sun in their respective orbits. The orbits are not circular but oval (Elliptical). The planets are also rotating on their own axis. This movement is called the "axial movement".

The other planets of the solar system are Mercury, Venus, Mars, Jupiter, Saturn, Uranus, Neptune and Pluto.

The venus is a very bright planet. In brightness, it is next only to the sun and moon.

Our earth is a planet. The objects in space going round a planet are called "satellites". The moon is going round the earth. The moon is a satellite of the earth. Similarly, there are statellites around Mars, Jupiter, Saturn, Uranus, Neptune and Pluto.

Activity 13.1

Watch the planet Venus at night. It is the brightest next to the moon.

13.4 COMETS

Among the objects in space of the solar system, there are bodies called "Comets".

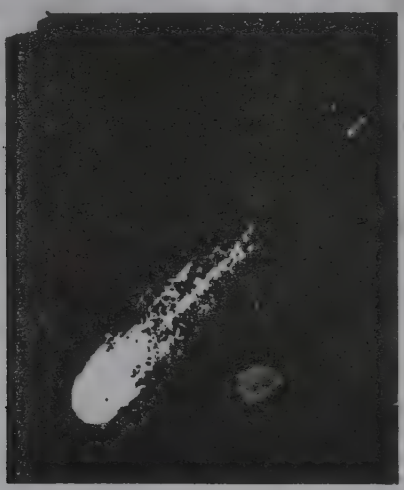


Fig 13.2 Comet

Comets are made up of gaseous and solid matter. They have a definite head and long tail. They are lighter than planets. They move round the sun. The tail ends of comets are always

away from the fun.

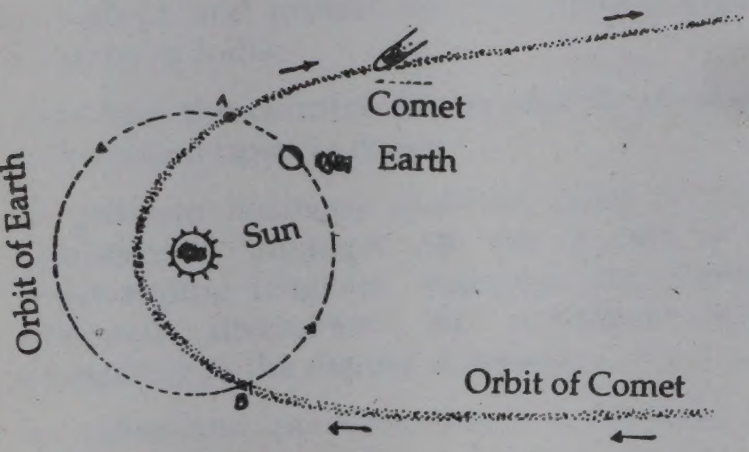


Fig. 13.3 : Orbit of a comet

Fig 13.3 Orbit of comet

See the orbit of a comet in figure 13.3 The solid matter in the head of a comet reflects sunlight. The tail of a comet is made up of gaseous matter and dust. The length of a tail of a comet may be thousands of kilometres to many million kilometers. "Halley's" comet is the most famous among the comets. This was discovered by an English Astronomer Edmund Halley in 1682. This is visible to us once in 75 years.

It appeared in 1758, in 1835, in 1910 and in 1985

Exercises

I 1. *Make a list of objects in space that you know.*

2. *The sun is brighter than the other stars. What is the reason?*

3. *What are the differences between stars and planets?*

4. *What are the differences between planets and satellites?*

5. *Describe the solar system.*

FUNDAMENTAL DUTIES

51A. **Fundamental Duties :** It shall be the duty of every citizen of India :

a. to abide by the Constitution and respect its ideals and institutions, the National Flag and the National Anthem;

b. to cherish and follow the noble ideals which inspired our national struggle for freedom;

c. to uphold and protect the sovereignty, unity and integrity of India;

d. to defend the country and render national service when called upon to do so;

e. to promote harmony and the spirit of common brotherhood amongst all the people of India transcending religious, linguistic and regional or sectional diversities; to renounce practices derogatory to the dignity of women;

f. to value and preserve the rich heritage of our composite culture;

g. to protect and improve the natural environment including forests, lakes, rivers and wild life, and to have compassion for living creatures;

h. to develop the scientific temper, humanism and the spirit of inquiry and reform;

i. to safeguard public property and to abjure violence;

j. to strive towards excellence in all spheres of individual and collective activity so that the nation constantly rises to higher levels of endeavour and achievement.

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